

THE IRON AGE

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Stamping Plant for Quantity Production

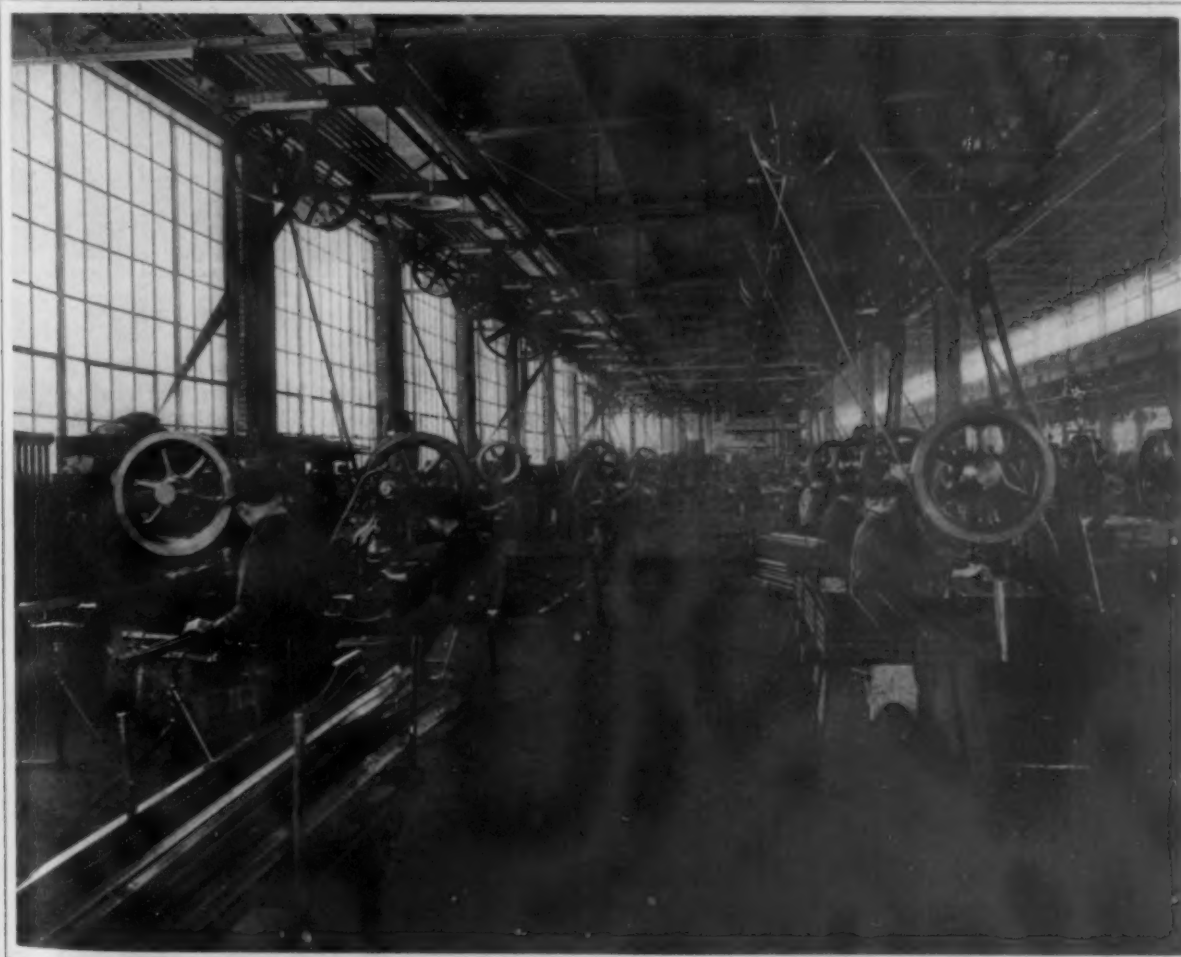
New Factory of the Parish & Bingham Company, Cleveland, Ohio, Having a Capacity of Over 2000 Automobile Frames per Day

BY F. L. PRENTISS

The automobile industry is responsible for a remarkable development in the manufacture of pressed steel stampings and has resulted in the erection of stamping plants with much greater capacity than the largest that were in operation a few years ago and the bringing out of powerful presses designed for handling the larger and heavier class of steel stamping work. The placing on the market of low-priced automobiles in large quantities, as well as the general tendency toward lower prices on high grade cars, has made the production of motor-car frames a quantity problem for the production managers of stamping plants. With one automobile manufac-

turer needing at times more than 1000 complete automobile frames per day, the large production has brought down the margin of profit to a low point, and shop methods have been greatly improved to bring the cost of production to a minimum. This change has also made it necessary that plants engaged in this class of work should be provided with the most modern equipment and arranged for the convenience of handling of material so that the shop costs are as low as possible.

When the automobile industry was in its infancy the Parish & Bingham Company, Cleveland, Ohio, turned its attention to making automobile frames

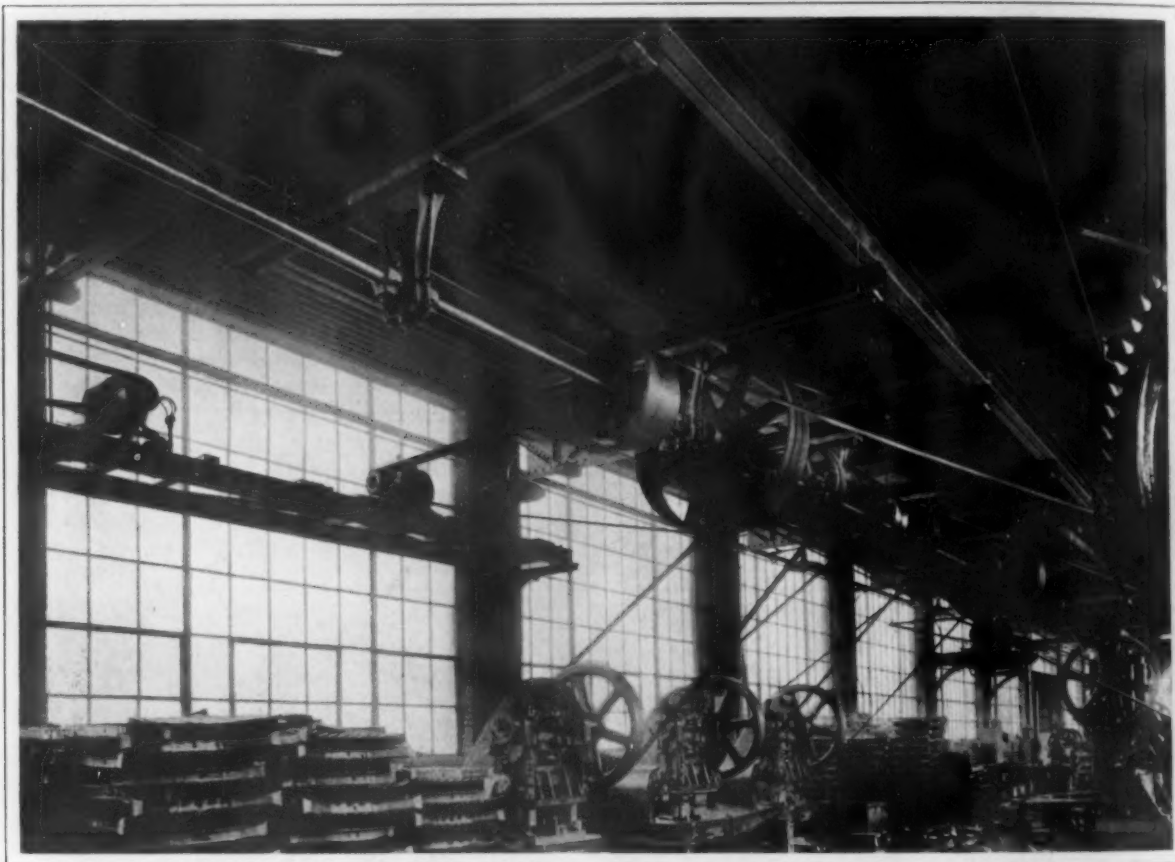


View in the West Bay Where Holes in Automobile Frames Are Being Perforated by Presses

and the growth of this department of its business has made it necessary to provide greater capacity and make desirable the erection of a plant better arranged for low cost production under the changed conditions. Abandoning its former three-story factory building on completion of its new quarters, this company has recently moved into a new plant on another site located in a different section of the city where sufficient ground space was provided for having the plant on one floor, and with plenty of room for further growth. All the manufacturing departments are housed in one unusually large factory building 900 ft. long and 100 ft. wide. The floor space provided is all in one room with the exception

monitory section and 14 ft. 6 in. high at the side walls.

Between the 30 in. brick pilasters the side walls are of glass, window sections being 13 ft. 6 in. wide and extending from the brick side wall 5 ft. above the floor up to the upper chords of the roof trusses. The vertical section of the monitor provides 7 ft. continuous window space. The large amount of side wall and monitor glass surface provides ample light in all parts of the plant. Ribbed factory glass is used throughout except for the first row of panes of the side walls which are of clear glass. These rows of glass are on a plane with the workman's eyes so that the general desire of employees to be able to



Line Shafts and Countershafts Supported by Channel Stringers and Bolsters; a Motor Platform at the Left; Tie Rods and Clamps for Bracing the Roof Trusses

of a small section partitioned off near one end of one of the bays for the annealing and pickling departments. The plant has various interesting features, including the design of the building, the transmission machinery equipment and the method adopted for supporting the motors.

The building is a steel frame structure with outside brick walls and is divided into a 40 ft. center bay and two side bays by two rows of steel columns spaced 32 ft. on centers. The structural design is somewhat unique in that there are no outside columns, the side bay roof trusses on 16 ft. centers being supported on the outside brick pilasters. The intermediate trusses are supported by longitudinal girders. The crane girders are independent of the longitudinal girders and are supported only on the columns, eliminating the possibility of vibration. This design adds to convenience in the hanging of shafting and in the placing of heating pipes in the roof trusses and makes possible the maximum amount of window surface on the sides. Above the center bay is a monitor. The bottom chord of the center roof trusses is 25 ft. above the floor. The outer bays are 17 ft. high at their junction with the

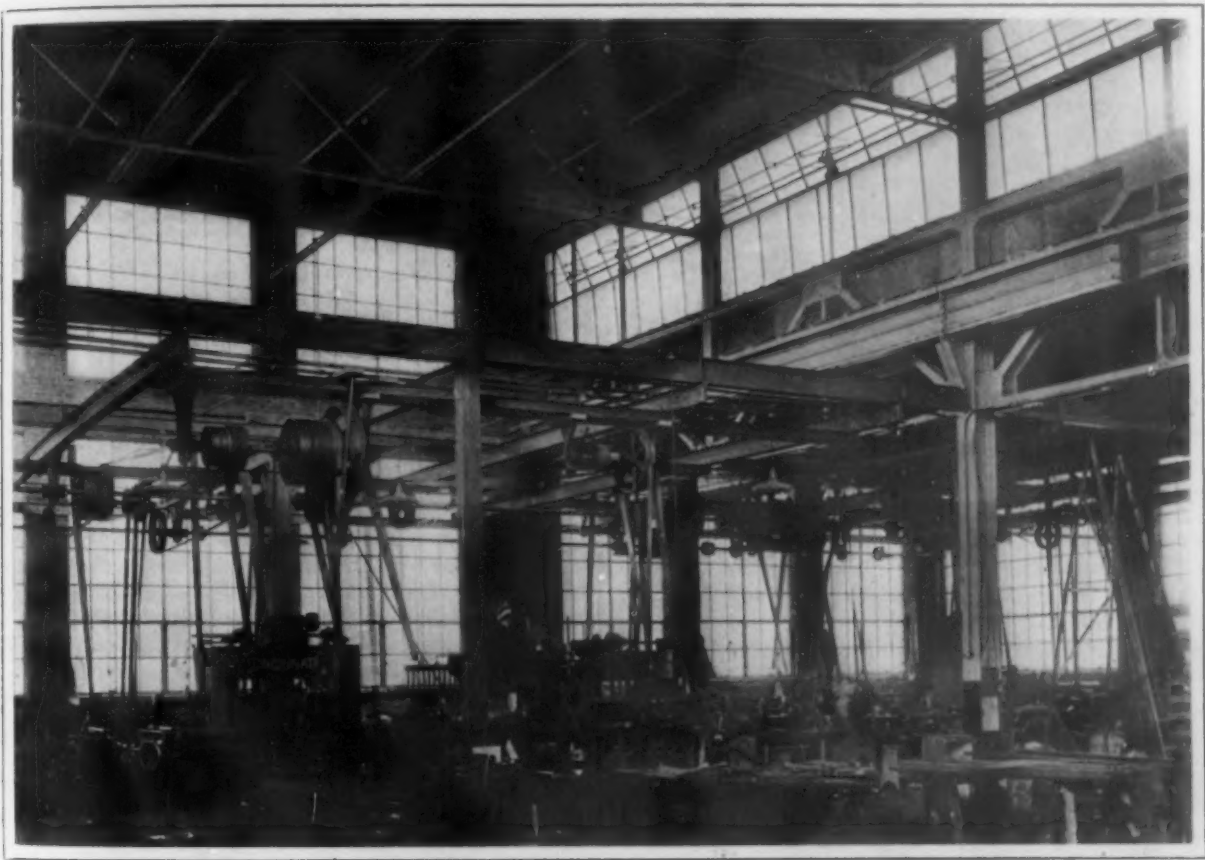
look out of doors is accommodated. The glass is set in Fenestra steel sash. The monitor sash are in two sections, a portion of the top section swinging outward for ventilation and being operated from the floor by chains.

The floor is constructed of creosoted wood blocks furnished by the Ayer & Lord Tie Company. The floor blocks are laid on a 6-in. concrete foundation with a 1/2-in. sand cushion between the concrete floor slabs and the wood blocks. The roof is of the flat type being formed of reinforced cement tile 5 ft. wide, 2 ft. long and 1 1/2 in. thick, and reinforced with steel rods. The roof covering is three-ply H. W. Johns-Manville Company asbestos and asphalt smooth surface roofing. Along the east side of the building there are several 8 x 9-ft. Kinnear & Gager By-fold metal doors and several small doors for use by workmen when the use of the adjoining larger doors is not required. The building is served by a 5-ton Toledo Bridge & Crane Company's electric crane that spans the center bay its entire length.

The plant is arranged for the convenient routing of material, the presses and other equipment being so located in the center and side bays that work

moves from one end of the building where the raw material enters until it passes out at the other end in the form of finished product. At the south or rear end of the building a switch track enters the center bay at the floor level and all raw material is unloaded at this point within the plant. Another switch track extends along the length of the east side of the plant and a loading platform is provided on this side at the north end of the building from which automobile frames and other products are loaded on cars, this track being depressed so that the loading platform and car floor are on the same level. The material in the process of manufacture is handled largely about the plant on hand trucks.

Various types of presses are used. The blanking and forming operations on side rails that require large and powerful presses are done on Bliss presses of various capacity up to 1000 tons. Three is the maximum number of operations required to form a part for a frame but most of the parts are formed in one operation. For forming the side rails for the larger and more expensive types of frames hydraulic presses are used, ranging in capacity from 500 to 1500 tons. The hydraulic presses are preferred to the power presses for long narrow work and particularly where the work is difficult and when the volume of production of a certain part is not large, necessitating a frequent changing of dies.



View Showing the Interesting Method of Carrying Shafting in the Center-Bay in the Tool Room

At the extreme north end of the plant two bay sections are used for tool-room purposes.

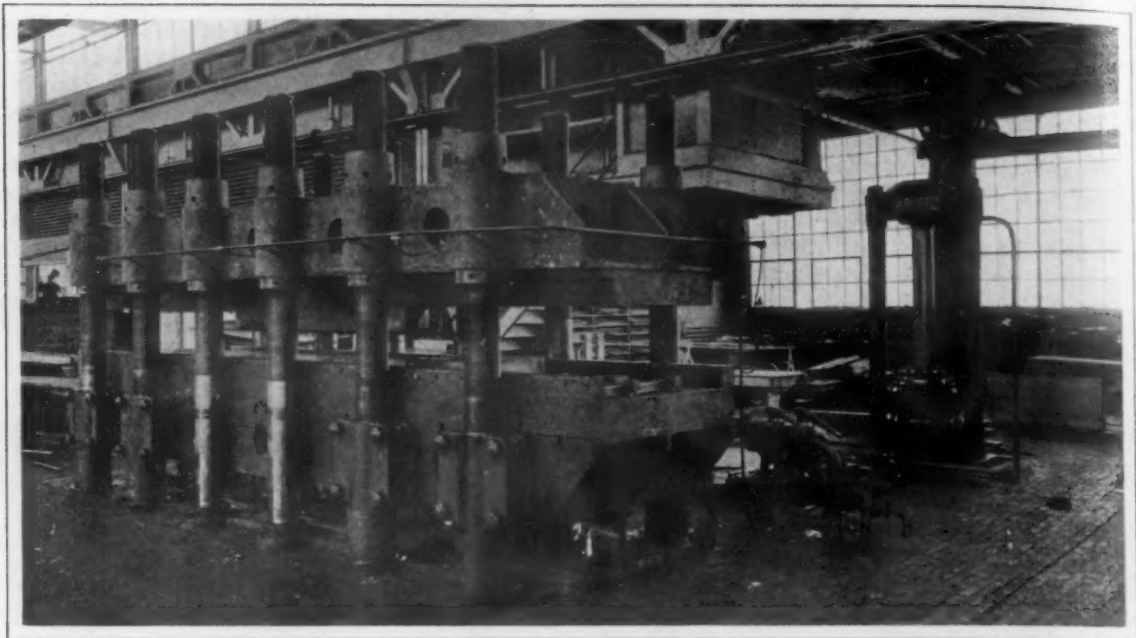
The capacity of the plant is indicated by the fact that 2000 Ford automobile frames can be turned out in a 12-hr. day besides carrying out the regular production schedule of other types of frames and other production.

For making automobile frames, steel ranging from $\frac{1}{8}$ to $\frac{1}{4}$ in. in thickness is used. The stock is first sheared to the desired size on a 16 ft. Toledo Machine & Tool Company shear located at the south end of the building near the unloading track. In the west bay at this end of the building is the pickling and annealing room. After being sheared the stock is pickled, a number of strips being placed in a cradle and handled in and out of the pickling tanks by means of a Euclid electric hoist. It then goes through the operations of blanking, annealing, forming, punching, assembling, riveting and painting in the order named. For annealing there is a battery of two gas-fired furnaces designed by the company. Each part is inspected after being formed and later there is an inspection of the finished frame. Imperfections found are usually of a minor nature and can be remedied.

The hydraulic press equipment was furnished by R. D. Wood & Co. and the Kilby Mfg. Company.

The usual practice has been to hot rivet automobile frames but a cold riveting process has been adopted recently in this plant that is regarded as preferable in some ways to hot riveting and this method is used for a large part of the work. It is stated that the rivet holes are more completely filled with metal when the rivets are upset cold than in the hot riveting process. After assembling, the rivets are put in place by hand and the cold upsetting is done on standard horning presses furnished by the Cleveland Machine & Tool Company. Special riveting fixtures are provided for holding the frames in position while being riveted. The riveting dies are of the ordinary type. Other power press equipment includes machines built by the Cleveland Punch & Shear Works Company, the Ferracute Machine Company and the V. & O. Press Company.

The punching presses used for riveting are conveniently arranged in rows and in the space between these presses are located large sheet metal tables only room enough being left between these tables for the workmen. These tables permit the convenient handling of the frames as they are being



Wood Hydraulic Press Used for Forming Side Rails for Large Automobile Frames

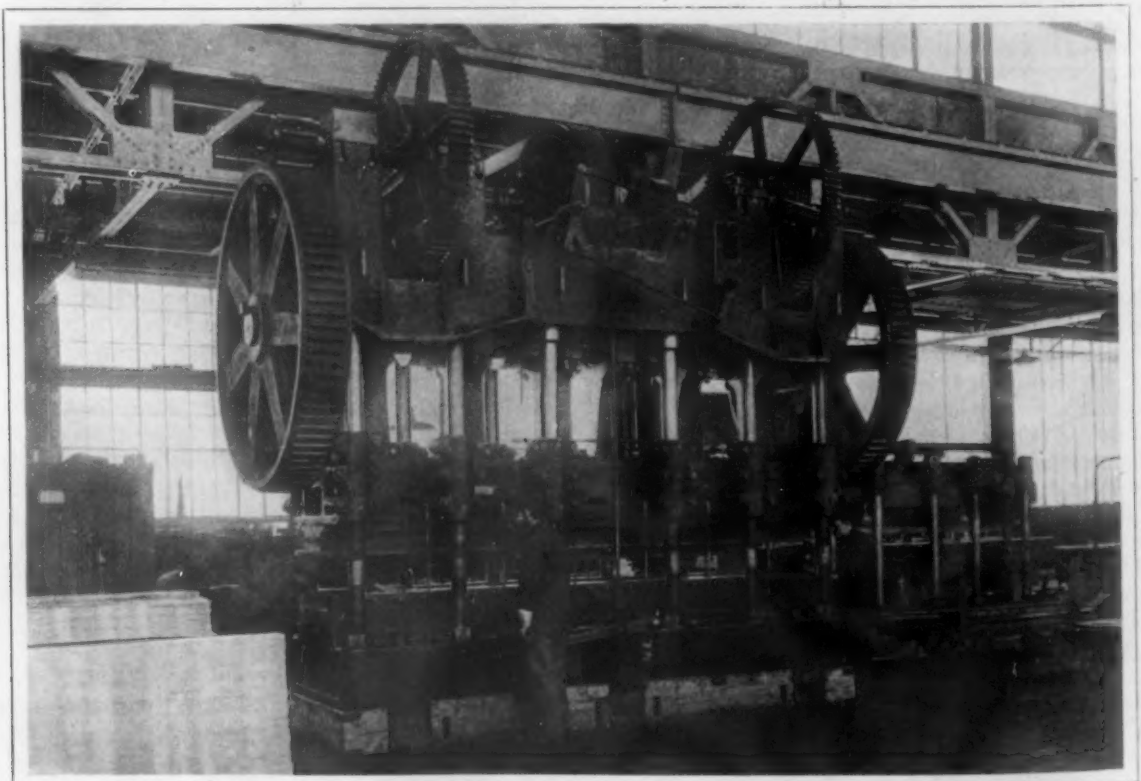
passed from one press to another for various riveting operations. After the frame is riveted, one priming coat of paint is applied with a brush. In making a Ford frame twelve pressed steel parts are used and these are fastened together with 44 $\frac{1}{4}$ -in. rivets. The regular gangs of men engaged on the press work turn out 1700 to 1800 Ford side rails in a day of 10 hr. and other parts are formed and assembled with equal rapidity.

The assembling department is provided with a number of rivet heating furnaces for hot riveting and with an air line running along the columns under the roof trusses for connection to the riveting hammers. An air line is also run under the floor for convenience so that air connections can be made in the floor in the center bay. Electrical current is provided throughout the plant for portable electrical

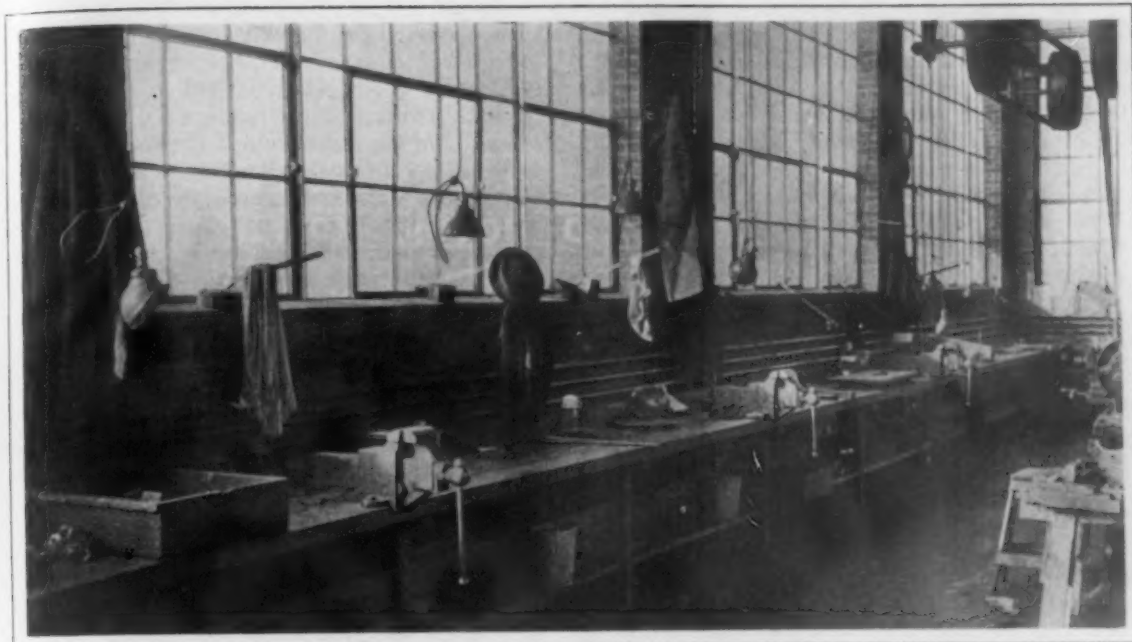
drills, wires being run in conduits down the sides of the building columns to a socket on the side of each column. Two sections in the west bay equipped with metal racks are used for a storage room, this department being enclosed with a wire screen. Practically the only wood in the plant is the floor.

The question of an economical and serviceable means of supporting the line shafts, countershafts and motors was given careful attention. First the location of each machine was made on the floor plan, with due regard for expansion of the different departments. The group plan drive was adopted as being the best for the service required and layout was made to insure good belt centers and to simplify the shafting supports.

The roof trusses are designed to carry a distributed load of 3000 lb. in excess of roof loads. With



Forming Side Rails for Automobile Frames on a Cleveland Press of 750 Tons Capacity



View Showing a Section of the Wall Benches

line shafts running transversely to the side bay roof trusses through several bays, as illustrated, the support of shafts and countershafts is accomplished by steel channel stringers and bolsters. The stringers are made up of 8-in. channels bolted together in pairs and spaced $\frac{7}{8}$ in. with pipe spreaders. These stringers are attached to the bottom chord of the roof trusses by means of U bolts, which loop over the truss members and pass between the channels, and $\frac{1}{2}$ -in. plates are bolted to the bottom of stringers with holes drilled to receive the U bolts. This permits the suspension of the stringers from the trusses without drilling either stringers or trusses, giving maximum strength and permitting the stringers to be moved conveniently to any point on the truss where gusset plates do not interfere. The stringers are put up in pairs on about 4 ft. 6 in. centers.

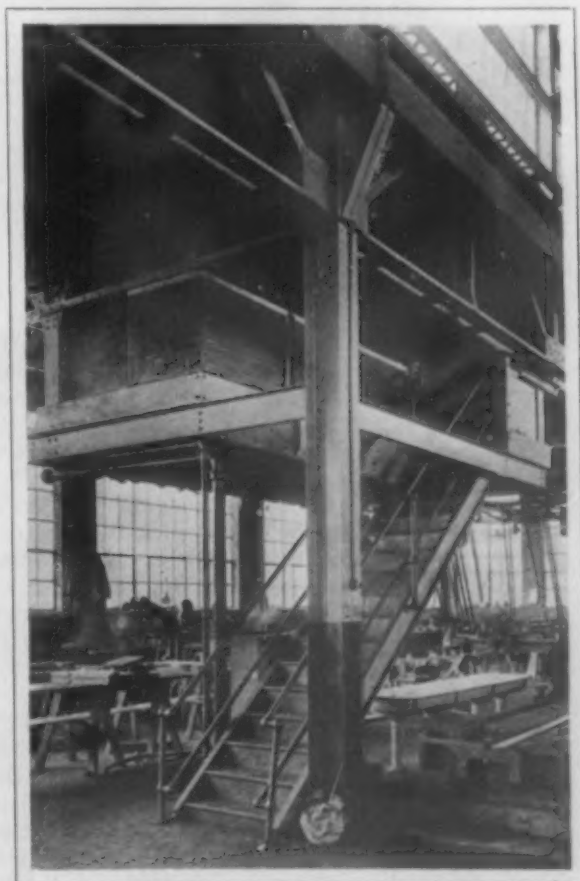
Where stringers are required for more than one bay, the middle sections meet in the center of the truss chord and a U-bolt plate is also a splice plate connecting the stringers. The end stringers of such a line are enough longer to use same U-bolt plate at the outer ends. If later another bay is to be included the end stringers will be moved one bay and 16 ft. stringers put up to fill in gap.

The drop hangers are suspended from 5-in. double channel bolsters attached to stringers by $\frac{3}{4}$ -in. bolts. The bolster channels are spaced by pipe spreaders to the width of the drop hanger feet, and special cast-iron spreader washers center the bolt at the bottom of bolster, and standard cast-iron washers are used on top of the stringers. Similar special washers are used on top of the bolster to attach the hanger, thus keeping hanger bolt central through the bolster. This design permits the bolsters to be moved any place along the stringers and the hangers moved any place on the bolsters, giving universal adjustment. Where shafting runs parallel to trusses, the drop hangers are bolted direct to stringers, and stringers are placed on about 8 ft. centers on the trusses.

The countershaft bolsters are made of 4 in. and 5 in. channels in pairs, the lighter being used where stringers are 4 ft. 6 in. centers and the heavier on 8 ft. centers. The countershaft hangers are either attached direct to steel bolsters or to wood bolsters attached to steel bolsters. This construction is light,

rigid and permits maximum adjustment to meet future distribution of equipment and does not interfere with either natural or artificial light.

To carry the tool-room shafting overhead, supports were required across the middle bay of this room as shown in one of the photographs. These are composed of vertical I-beam members carried on concrete piers and horizontal I beams at the same elevation as the bottom chord of the side bay roof trusses. The stringers are attached to the I beams by U bolts in the manner previously described. The tool-room shafting is driven by a 15-hp. motor, which is supported by standard size steel bolsters suspend-



Elevated Toilet Room with Lavatories Underneath

ed from the stringers. It will be noted that the vertical I beam in front extends above the other members. This is designed to carry a 2-ton jib crane to be installed later to handle heavy castings.

There are six motor platforms carrying one or more motors ranging in capacity from $7\frac{1}{2}$ to 60 hp. These platforms are of structural steel, riveted and braced and mounted on cast-iron wall brackets. The brackets are attached to the pilasters by through bolts with large cast-iron washers on outside for the smaller ones and 15 in. channels for the two larger platforms. To make the platforms more rigid a stud is dropped from the bottom of the roof truss to the end of the bracket, with lock nuts above and below the bracket arm, thereby preventing either up or down movement to the platform. As the platforms are about 10 ft. above the floor, they do not interfere with the light and save valuable floor space.

The line shafting is all $2\frac{7}{16}$ in. diameter turned steel, with flange couplings, pressed and keyed on. The drop hangers are ball and socket collar oiling, with both lateral and vertical screw adjustment. It was found necessary after the line shafting was erected and running to overcome end movement. This lateral movement was caused by the suspended load from the roof trusses, which were not braced laterally, except by purlins on upper chord. Tie cords of $\frac{3}{4}$ -in. round stock with nuts at each end crossed from top to bottom of truss members entirely removed this objection. A special casting was designed to clamp to the truss, provided with slots for holding and spacing the rods. These rods and clamps are shown in one of the illustrations.

One of the photographs shows wall benches which are $33\frac{3}{8}$ in. high and 28 in. wide. The cast-iron bench legs used are of improved design, the legs, top and shelf bridge being of I section, which gives a light, rigid and sturdy construction. The anchor bolts are set in cement in holes drilled in the concrete floor slab, and bolts pass through a spacer block, the latter bringing the leg up flush with the top of wood block floor. The legs are spaced 6 ft. apart, and the top boards are in 12 ft. lengths. The front board is clear hard maple $2\frac{3}{8}$ in. thick, 12 in. wide, and the remainder of the top, shelf and back board are yellow pine $1\frac{1}{4}$ in. thick. About 250 ft. of wall benches have been installed. Center benches are also used which are 36 in. wide with two clear maple planks at edges and center of yellow pine. These benches are made up in running lengths or self contained two-leg type, using bench legs of design similar to those illustrated. Metal tool drawers lined with wood ends and bottoms are provided.

The steel shafting supports, motor platforms, shafting, bearings and wall benches were designed, built and installed by the Hill Clutch Company, Cleveland.

The toilet arrangements are of more than ordinary interest. In the west bay there are five toilet rooms placed an equal distance apart and located between the roof trusses from which they are suspended, giving clearance beneath of 10 ft. These are of steel and concrete, the floors being concrete slabs. The partitions and backs are slate slabs and the wainscoting to the height of the railing at the front is of slate. Entrance to the rooms is by an iron stairway. Each toilet room has four closet bowls of solid porcelain integral with seats and two pedestal urinals. Each fixture has a $3\frac{1}{2}$ -in. local vent, the vent flues being brought together into a galvanized flue that connects to a 20-in. ventilator above the roof. One of the closets in each unit for use for the foreman is provided with a door and lock, but the others are without doors. Under each toilet room back of the stairway is a 12-ft. enameled wash

basin and a drinking fountain, the latter connected to a water cooler furnished by the Manufacturing Equipment & Engineering Company, Boston. The location of the toilet rooms has a number of advantageous features. Practically no ground floor space is used and the space behind the stairs makes a convenient place for the lavatory and drinking fountains. The toilet rooms are light and airy and easily ventilated to the roof and cause no obstruction to the light on the factory floor.

The building is artificially lighted by 250-watt Mazda lamps spaced 70 ft. apart in the center bay and two rows of 100-watt lamps in each side bay, two of these lamps being in each bay section. Individual lamps in 25-watt sizes are placed around the machines as needed. The 27 bay sections are designated with numbers on the building columns between the center and side bays for convenience in locating any section of the plant.

At the rear end of the factory building is a power building containing the heating plant, transformer, switchboard, accumulator and air compressors. The building is heated by steam pipes running along the side walls beneath the windows and from the roof trusses. Electricity is taken from a commercial circuit and is stepped down for power to 440 volts, alternating current. The air supply is furnished by an Ingersoll & Rand electrically driven compressor with a capacity of 300 cu. ft. per minute and a Chicago Pneumatic compressor. A two story brick office building occupies a site on the street a short distance from the plant. The office building is heated by a hot water system with forced circulation through pipe coil radiation, hot water being supplied by two return tubular boilers. The system was designed and installed by the General Fire Extinguisher Company.

The plant was erected by the McClintic-Marshall Company, Pittsburgh, Pa., the general contractor. It was designed by Ernest McGeorge, consulting engineer, Cleveland.

Claims for Railroad Loss. Damage or Delay

The United States Steel Products Company has issued a circular calling attention to that portion of Section 3 of the uniform bill of lading, which reads as follows:

Claims for loss, damage or delay must be made in writing to the carrier at the point of delivery or at the point of origin within four months after delivery of the property, or, in case of failure to make delivery, then within four months after a reasonable time for delivery has elapsed. Unless claims are so made, the carrier shall not be liable.

While this clause has been in the bill of lading ever since it was approved by the Interstate Commerce Commission and sustained by the United States Supreme Court, the transportation companies have not strictly observed it, but the Steel Products Company is now informed that they intend hereafter to strictly enforce this condition. The importance of this matter is impressed upon consignees in order that they may be assured of protection in the event that they have any claims of this kind.

The West Leechburg Steel Company, with general offices in the Farmers Bank Building, Pittsburgh, Pa., and works at Leechburg, Pa., has opened Western sales offices in suite 501-502 City Hall Square Building, Chicago, the administration of which will be in the hands of a staff trained in the works and general offices. Desire for a closer business relationship with customers has been responsible for assuming the duties heretofore delegated to the Charles G. Stevens Company under an agreement terminating March 18, 1915. The company manufactures hot-rolled, cold-rolled, pickled and annealed strip steels and steel hoops and bands.

Special Multiple Screw Driving Machine

A special machine for driving screws in two straight lines simultaneously has been supplied the Ford Motor Company by the Reynolds Pattern & Machine Company, Moline, Ill. A typical piece upon which the machine operates is shown standing at the right of the engraving and there are two rows of screws in each face, top and bottom. After the screws are all driven the work is ripped longitudinally and forms the left and right body sills of the Ford car.

The mechanism for delivering the screws to the chucks or screw guides and for driving the screws is similar to that of the builder's other machines. The screws are thrown at random into the pans or hoppers at the top of the machine and are arranged by the magazines for delivery to the chucks or screw guides as required. Friction drive is employed for the spindles which is relied upon to enable the screws to be set to any desired degree of tightness without over-running or splitting the screw heads.

In operation the work-carrying fixture, which is mounted on small wheels running on a track that extends on both sides of the machine, is run to one end and loaded. When the load is complete the hook-shaped parts which are shown projecting over the top of the fixture are brought down on the work individually by the handles alongside of the fixture. When this is done the fixture is indexed along the track by the hand-wheel. The pieces are countersunk before being placed on the work fixture and when the countersinks for the screws come under the spindles the screws are driven by the operators, one on each side of the machine, depressing the foot levers. As soon as the screws are driven the work is moved along to the next position by the hand-wheel and when all the screws on one face have been driven the fixture is turned over on the trunnions and locked with the other side up by the pin below the left trunnion. The work is then indexed back through the machine and the screws are driven in the other face.

When all the screws have been driven the clamps are released by turning over the two crank handles at the left end and the work is permitted to drop through the fixture upon supports placed below the track to receive it. The fixture is revolved to bring the open side on top and is reloaded. During the driving process the previous piece is removed by the helper and the stock prepared for the following one. The work is adjusted for height by the inclined shaft on the front of the machine having a crank on its upper end.

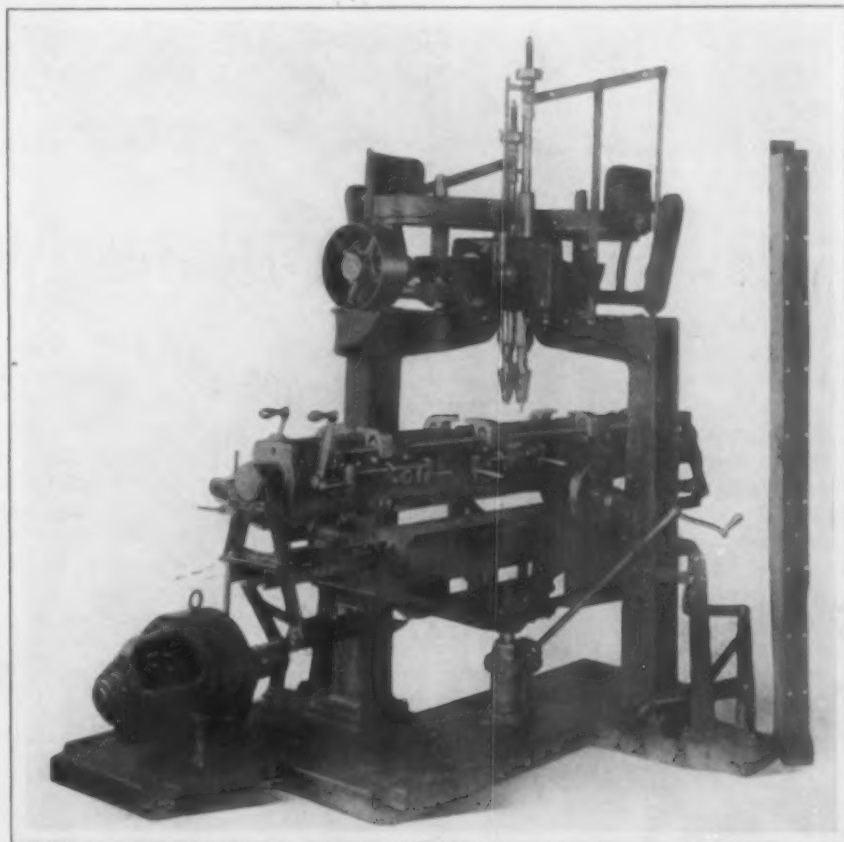
The machine as illustrated is equipped with motor drive but can be furnished for belt connection with a countershaft if desired. The speed of the machine spindles is approximately 720 r.p.m.

and it is pointed out that the screws are driven much faster than could be done by hand, while at the same time they are drawn tighter.

The War and Copper

Copper has been very decidedly affected by the war. Imports by Great Britain in 1914, according to Consul General Robert P. Skinner, of London, England, writing January 22 in Commerce Reports, were 150,466 tons in 1914, as against 106,948 tons in 1913. Of the 1914 total 96,991 tons came from the United States, and 16,483 tons from Australia, while in 1913 this country sent 53,866 tons to Great Britain. In 1914 Great Britain exported only 7269 tons, against 14,907 tons in 1913.

In the first five months of the war, August to December inclusive, the United States exported 255,193,542 lb., valued at \$32,005,686, compared with 387,447,601

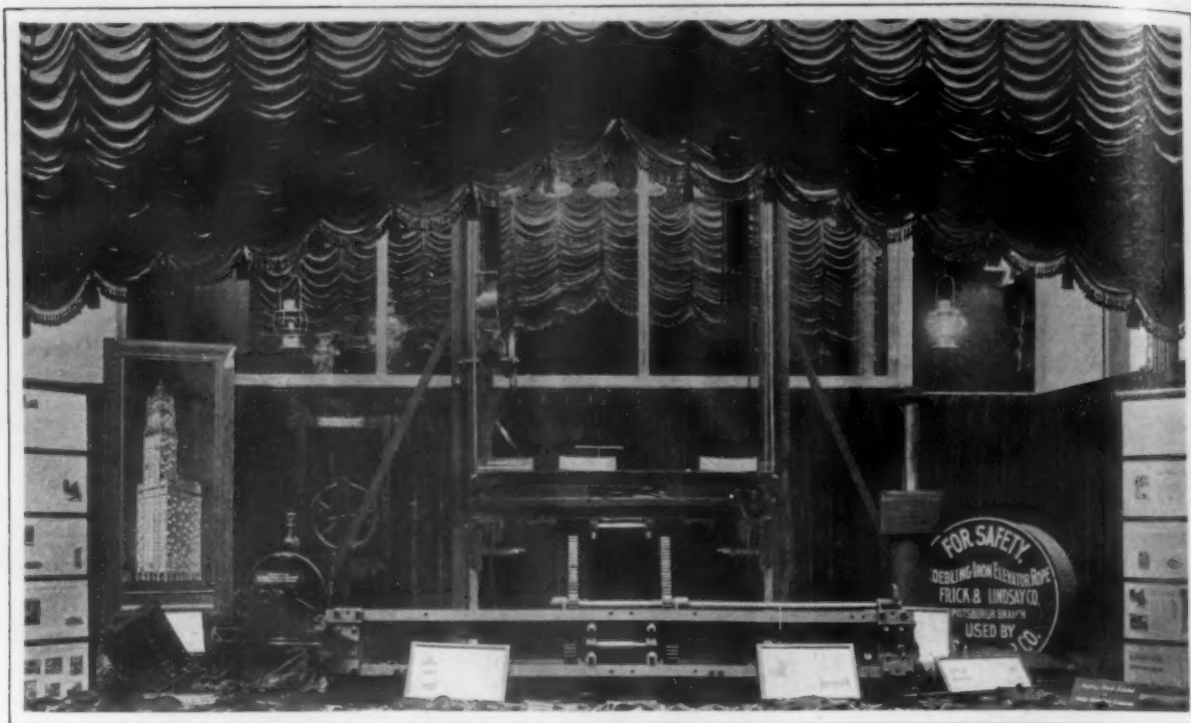


A Special Machine for Driving Two Rows of Screws Simultaneously

lb., valued at \$59,768,501 in the same period of 1913. The effect of the war on the distribution of copper exports is shown in part by the following:

Countries	Aug. 1 to Oct. 31, 1913		Aug. 1 to Oct. 31, 1914	
	Pounds	Value	Pounds	Value
Austria-Hungary	14,999,218	\$2,320,066		
France	73,851,584	11,254,905	49,357,219	\$6,258,680
Germany	128,534,107	19,852,842		
Italy	16,020,441	2,437,853	28,835,684	4,749,968
Holland	67,514,725	10,399,494	17,619,358	2,182,777
United Kingdom	56,539,038	8,698,462	102,022,497	12,791,024
Other Europe	7,806,212	1,199,828	34,868,209	4,228,598
Canada	13,014,932	2,149,007	8,078,013	1,137,458

The Mining and Metallurgical Society of America will hold a meeting in New York on March 18, where the society's annual medal will be presented to Robert H. Richards, professor of mining engineering and metallurgy, Massachusetts Institute of Technology, in recognition of his services in the advancement of the art of ore-dressing. The net increase in the society's membership in 1914 was 24, compared with only 3 in 1913.

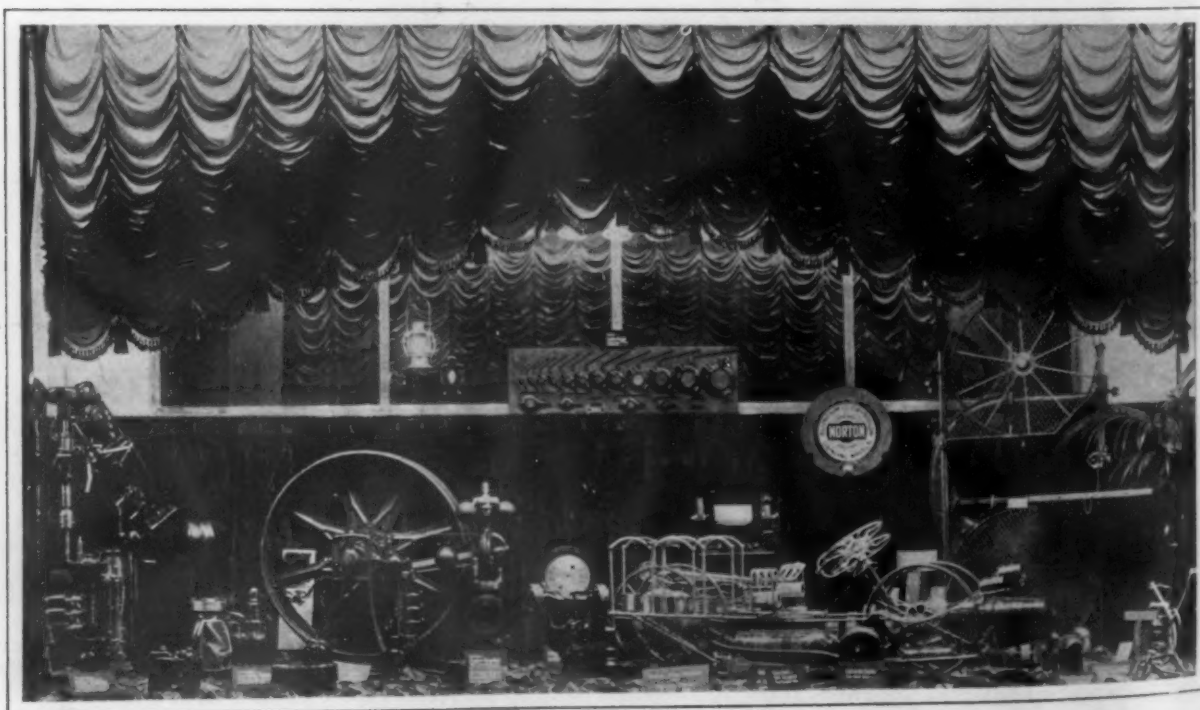


How Safety-First Devices Were Displayed

A Safety First exhibit occupying a number of display windows in a large department store, taking up with a display of mechanical equipment space usually devoted to goods that appeal more to the feminine eye, is a novelty. Such an exhibit was made recently in the store of McCreary & Co., in Pittsburgh, and attracted an unusual amount of attention. Great interest was shown in the display by those ordinarily not directly interested in safety appliances in factories. As a safety first exhibit it gave the manufacturers an opportunity that they probably would not otherwise have been able to secure to display their products before prospective purchasers as well as before the gen-

eral public. Had a machinery manufacturer approached the owners of the store with a request for permission for use of window display space to show their products, the request doubtless would not have been granted. However, as a safety first exhibit, it appealed to public interest and the store management willingly gave the use of the show windows for the display.

Several weeks ago W. A. Hall, Pittsburgh district manager of the hoist and crane department of the Yale & Towne Mfg. Company, and Harry F. Cramer, sales manager of the Somers, Fitler & Todd Company, Pittsburgh, took the matter up with McCreary & Co. They requested that the store



Somers, Fitler & Todd Window with American Pulleys and Norton Grinding Wheels

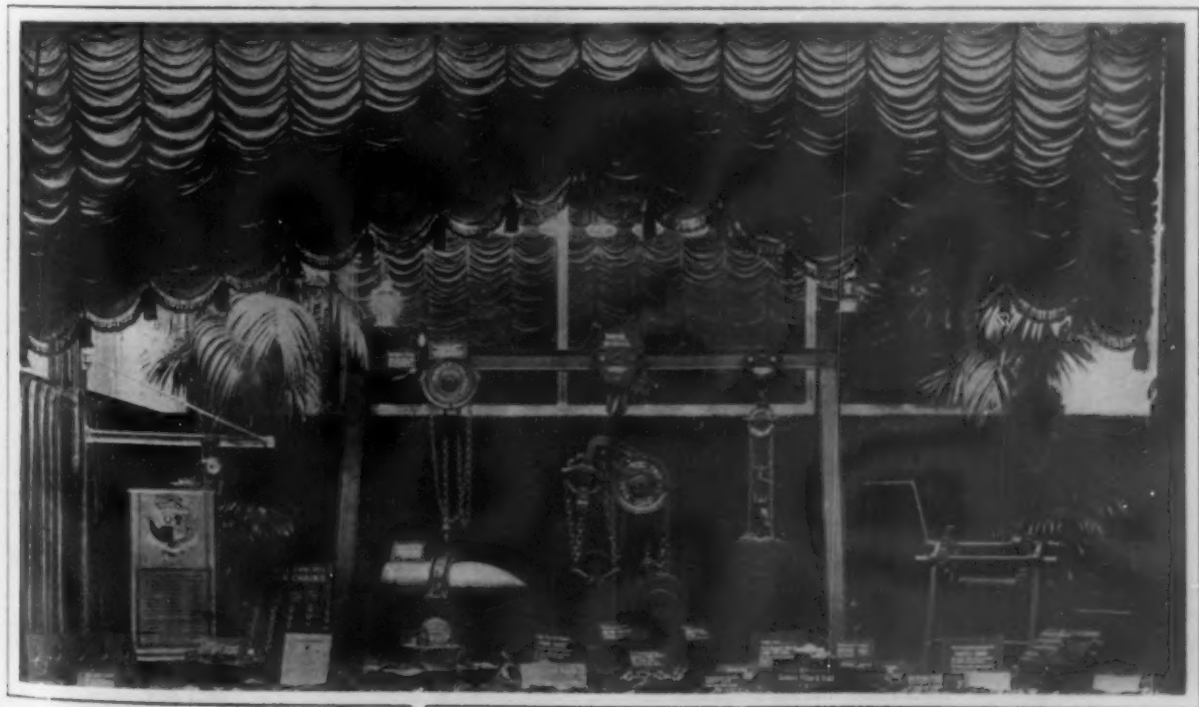


In Pittsburgh Department Store Windows

management allow the use of one of its prominent display windows for a period of 10 consecutive weeks, the windows to be used for the display of the products of some companies along safety first lines during each of the weeks. Instead of allowing the use of one window for 10 consecutive weeks, the store offered the use of 10 windows for a period of one week. However, the exhibits attracted so much interest that before the expiration of the first week the manager of the store asked that it be continued for a second week and this was done. The interest in the exhibit continued until the last day, and one day when a count was made 25,000 persons stopped to investigate one

or all the windows, of which there were ten all told.

The companies making the exhibits were given full permission to display whatever they wished and in placing their displays were aided by the window dresser of the store, who added various decorative features in the background to make the displays as attractive as possible. The interesting character of the exhibits is indicated by the accompanying reproductions of photographs of some of the windows. Exhibitors were the Yale & Towne Mfg. Company, the Westinghouse Electric & Mfg. Company, the Westinghouse Air Brake Company, the Pennsylvania Department of Labor and Industry, the Otis Elevator Company, the Somers,



Brown Hoist and Yale & Towne Exhibits, Including a 12-In. Shell



Exhibit of the Department of Labor and Industry of Pennsylvania

Fitler & Todd Company, the Pennsylvania Railroad and the Pittsburgh Railroad Company.

The Yale & Towne window also included a display of products of the Brown Hoisting Machinery Company. This window had a particular attraction to the general public because the display included a 990-lb. 12-in. shell such as is used on United States battleships. The shell was suspended by a specially designed crane manufactured by this company and used by the army and navy departments. A card displayed in connection with the exhibit announced that the shell had a range of approximately 12 miles and that the famous 42-centimeter shells used by the German army have a diameter of 4½ in. more and have a range of approximately 8 miles more. In this display there were also Yale & Towne safety hooks, hoists and locks and other products. The Brown Hoisting

Machinery Company's exhibit, which was an important feature of this window, included three trolleys, a winch and a safety crab.

The Somers, Fitler & Todd Company had a tastefully designed imitation automobile made of such safety appliances as hose, hose reels, fire extinguishers, fire buckets, hose pulleys, etc. This company's display also included machinery equipped with safety appliances and other appliances such as safety water gauges, engine governors, American steel pulleys, Norton grinding-wheels and a large band saw screened for protection of workmen. The machinery shown in this exhibit was operated by a Westinghouse motor concealed in the back-ground.

The exhibits of the Westinghouse Electric & Mfg. Company and the Westinghouse Air Brake Company vied with others in attracting attention.



Modern Road Bed Construction of Pennsylvania Railroad Shown

In one window was a framed photograph of George Westinghouse, draped with American flags and a number of safety high efficiency airbrakes. A sign in this window stated that it required two of the largest locomotives and a distance of 5 to 7 miles for a 12-car train to attain a speed of 60 miles an hour and that the airbrake is capable of bringing this train to a stop within about 1000 ft. Without the airbrake the train would run 6 or 7 miles before stopping. The Westinghouse electric exhibit contained safety devices in use in its own works and a large sign stated that "Our safety ideas are free to all."

The exhibit of the Otis Elevator Company was attractive both from a mechanical and artistic standpoint. It included a working model of the Woolworth Building in New York, showing the battery of elevators in operation. A full size modern elevator equipment showing all the safety features connected with this type of passenger conveyance was shown, together with a reel of the Roebling iron elevator rope which was lent for this exhibit by the Frick & Lindsay Company, Pittsburgh.

One of the most interesting exhibits was that of the Department of Labor and Industry of the State of Pennsylvania. In this, working models of safety appliances and pulmotors were shown as well as protecting goggles, the latter having been broken in service in a manner that probably would have meant the loss of the workman's eyes had they been unprotected. A large sign in connection with this exhibit called attention to the nation-wide work of the National Safety Council along safety first lines similar to the work carried on by the state organization.

In the exhibit of the Pennsylvania Railroad Company was a section showing the construction of a modern roadbed including rail, ties, and ballast. Adjoining this was a section of rail used by this company over a half century ago, this being in contrast with the modern heavy steel rail. Other sections of rails showed the development of the rail industry from its infancy to the present time. In addition another window display showed the apparatus and warning signals used by this railroad in preventing accidents among its workmen and a large bulletin called attention to the company's claim that out of 188,411,876 passengers carried in 1914, on all of its lines, not one had been killed in a train accident. The exhibits of the Pittsburgh Railways Company included photographs showing the proper method of boarding and alighting from cars and a map giving the location of free pulmotor service stations. At one end of this exhibit interesting pictures along safety first lines were projected upon a screen during the evenings.

Greenfield Tap Corporation Consolidates Stores

The Greenfield Tap & Die Corporation, Greenfield, Mass., which is comprised of the following screw cutting tools manufacturers: Well Brothers Company, Wiley & Russell Mfg. Company, and A. J. Smart Mfg. Company, has made the following changes in its New York, Philadelphia and Chicago stores:

It now maintains one store only in New York, located at 28 Warren street, the former location of the Wiley & Russell store. The Wells Brothers' store, at 107 Lafayette street, has been discontinued.

In Chicago the Wiley & Russell store at 545 West Washington boulevard has been discontinued and the stores consolidated at 13 South Clinton street, the former location of the Wells Brothers' store.

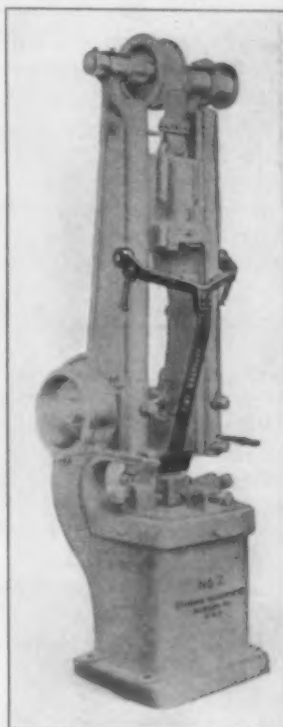
D. A. Schnebel, manufacturers' agent, on March 1 removed from 155 Chambers street to 87 Warren street, New York.

A New Safety Device for Drop Hammers

With a view to protecting the operators of drop hammers, the Standard Machinery Company, Auburn, R. I., has brought out a safety device. This

is intended for use on plain, automatic or board drop hammers, where it is necessary for the operator to use his hands in placing the work which is to be done on the die. This device, it is emphasized, will operate every time the hammer descends, whether the movement be due to accident, such as the belt breaking, the eye in the hammer being damaged, or any working part of the machine injured, or occurs in the regular course of operation.

When the hammer is at the upper limit of its stroke, the work is placed on the die, and the fan or blade of the safety device is at the back of the die toward the rear of the hammer. As the hammer descends, a roller on the front comes in contact with the inclinable blade and pushes the operator's hands from the path of the hammer.



A Device That Has Been Developed for Use with Plain, Automatic or Board Drop Hammers to Protect the Hands of the Operator

Two springs are relied upon to bring the safety device back into its original position when the hammer rises.

Screws working in slotted holes enable adjustments for width and height to be secured, thus enabling the device to be shifted to different widths of hammer, if that should be desired, as well as accommodating different heights of dies on the one machine. Studs located in the side of the frame are employed for the device to swivel on. The outside of the guard, which is toward the operator, is covered with a single thickness of leather, so that while the hand of the operator will be struck if it is in the way, it will not, it is emphasized, be bruised.

Record for Prompt Shipment

An exceptional record for prompt shipment was recently made by the Whiting Foundry Equipment Company, Harvey, Ill., in filling an order for a three-motor electric traveling crane of 10 tons capacity and 30 ft. span. The order was received by wire at the company's plant January 23 and called for delivery of the crane, complete, on the purchaser's runway at New Bridge, Del., February 10, 1915. Drawings were prepared, the crane constructed and shipment made January 29, 1915. The crane reached New Bridge February 4 and was erected and ready for service February 6, or four days ahead of schedule time.

Rough handling of timber in milling or manufacturing often causes slight compression failures that seriously impair its strength. According to the United States Forest Service they are indicated by little diagonal streaks or wrinkles across the grain, and have also been found due to violent windstorms. Hitherto unaccountable breakage in hickory wagon spokes and other presumably strong material is probably due to them.

The X-Ray in Metallurgical Research

Its Use in the Examination of the Interior Structure of Copper Castings—The Method May Open a Wide Field of Investigation

The novel application of the Coolidge X-ray tube to the examination of steel castings was presented in *The Iron Age* of January 21, 1915. That this method of metallurgical research may develop into one of considerable importance is indicated by the following abstract of an article in the *General Electric Review* by Dr. Wheeler P. Davey, of the research laboratory of the General Electric Company, entitled "The Application of the Coolidge Tube to Metallurgical Research," and dealing with the examination of the interior structure of copper castings:

Dr. Weintraub in the February, 1913, number of the *Journal of Industrial and Engineering Chemistry* describing boron and its compound says:

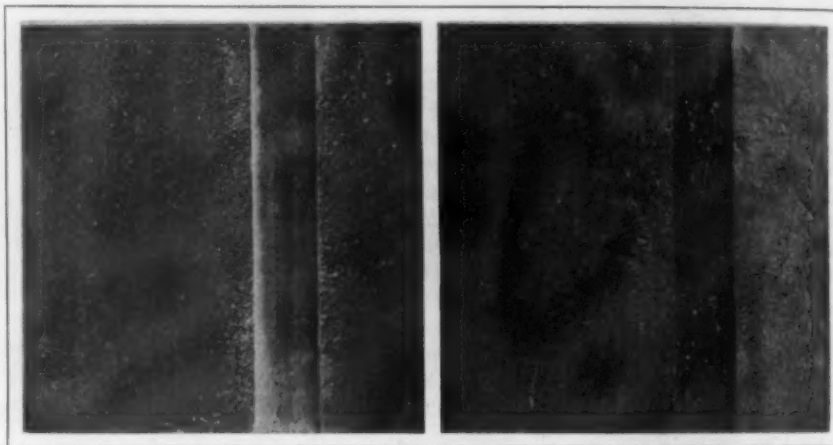
"Boron suboxide, a by-product obtained in the manufacture of boron, can be used for obtaining high conductivity cast copper. Copper cast without additions is full of pores and blowholes, and therefore mechanically unfit and of very low electric conductivity; the removal of the gases from copper by the known deoxidizers is liable to give an alloy containing a small amount of deoxidizer, an amount sufficient, however, to lower the conductivity of the copper very considerably. Boron suboxide, however, has the property of deoxidizing copper without combining with it, as boron suboxide has no affinity for copper. Tons of copper are cast now by this process, improving the quality of the product and at the same time cheapening it."

In the refining of copper for electrical purposes, the electrically deposited metal is melted in a reverberatory furnace. A world of delicate chemical control is connected with this furnace refining. When ready to pour, the metal is cast into open iron molds which give a copper pig or bar of about 75 lb. in weight.

If the metal were merely melted and then poured

the casting would be full of blowholes and would be of low electrical conductivity. The molten copper is allowed to oxidize in the furnace and the oxidation is augmented by air blown into the metal. When the melt contains five or six per cent. of oxide, the major part of the other impurities have been burned away and the work of reduction is started. As ordinarily done, this consists in the so-called "poling." Green sticks are submerged in the molten copper and the gases and carbon reduce the oxide and such harmful products as sulphur dioxide are driven out of the metal. The proper time for pouring is not that representing complete reduction of all oxide, as it has been determined by experience that over-poling also gives a porous inferior ingot.

It was once believed that the copper absorbed



Figs. 2 and 3—Ordinary Photographs (Left) of a Block of "Unboronized" Copper and a Block (Right) of "Boronized" Copper

carbon which in over-poled copper caused the rising in the mold and the porous condition when cast. Hampe corrected this idea and attributed the porous state of over-poled copper to the effect of absorbed hydrogen and carbon monoxide. In any case the fact remains that if we merely melt copper and cast it we get a porous casting, and if we thoroughly remove dissolved oxygen by carbon or similar reducing agents, we also get a porous casting.

The use of the boron flux of Weintraub has done away entirely with the difficulty of obtaining sound castings of high electrical conductivity. It seemed interesting to illustrate the effect on the porosity by an investigation using X-rays. For this purpose some high grade copper was melted in the usual way and poured into a sand mold to give a block 10 x 10 x 3/4 in. Another portion was treated with one per cent. of the boron flux at the time of pouring and was cast in a similar mold. These two castings were then placed side by side on an 8 x 10-in. Seed X-ray plate, 22 in. from the focal spot of a Coolidge X-ray

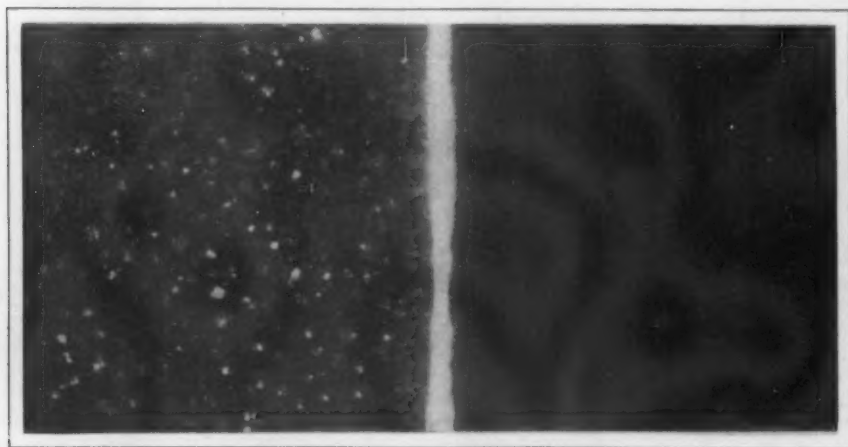


Fig. 1—Radiograph of a Block of "Unboronized" (Pure) Copper Side by Side with a Block of "Boronized" (Pure) Copper. The Difference in Internal Structure is Striking

tube and exposed for two minutes. The current through the tube was 2.8 milli-amperes and the potential difference across the tube corresponded to a 10-in. parallel spark gap between points. The resulting radiograph is shown in Fig. 1. The copper cast in the ordinary way is seen to be full of pores. That cast with the boron flux is so perfect that no holes are visible. The two castings were

The Safe Barrow Handle

BY J. D. HACKETT

In factories with narrow doors and rough ground the unprotected iron handles of heavy barrows often swerve and cause bruised fingers. To prevent such peculiarly troublesome wounds several designs have been tried and one kind has a spur riveted to the outside of the handle and shaped somewhat like a sword guard. The simplest of all, however, is made by elongating and turning round the end of the handle with a generous loop as in the accompanying sketch. This handle proves to be very well adapted for its work, accidents diminish and a saving of far more than the very slight cost of manufacture is easily effected. In one factory where the device was tried accidents were a quarter of their former number after it came into use.

Care should be exercised to leave the loop quite wide so that, should the barrow fall sideways, the workman's hand

may be withdrawn without running the chance of a sprained wrist which sometimes happens if the handle is too narrow. Another point to be observed is that this form is much easier to grasp

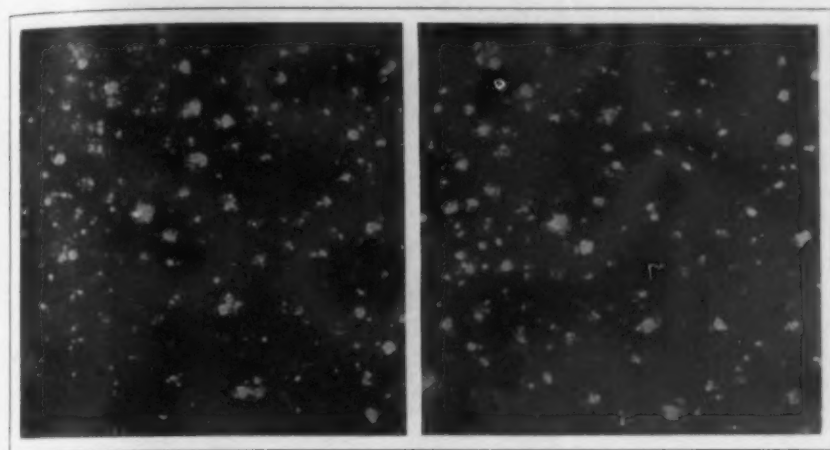


Fig. 4—Stereoscopic Radiograph of a Portion of the Block of "Unboronized" Copper. When Viewed Through a Hand-Stereoscope this Shows the Size and Relative Depths of the Pores

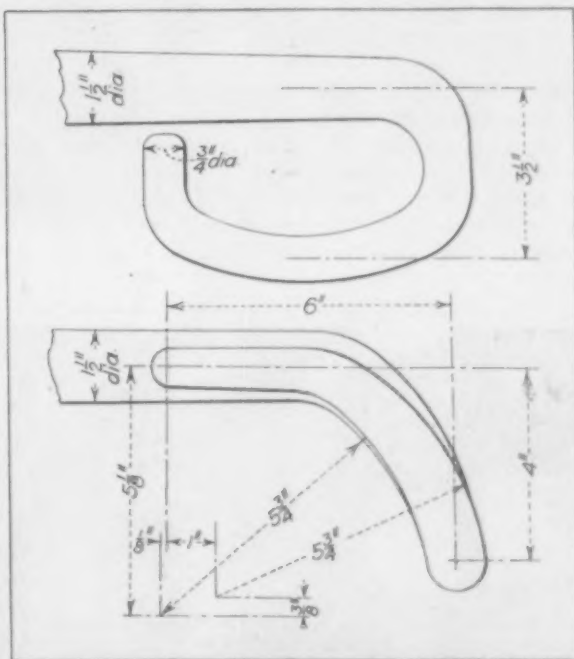
then taken to the machine shop and a portion of the surface of each was machined as smooth as possible. Ordinary photographs were then taken, Figs. 2 and 3. As was to have been expected from the radiograph, Fig. 1, the holes were clearly visible in the common copper. In the "boronized" copper the holes are either entirely absent or are microscopic.

The advantage of the radiograph in experimental work is obvious. Without the use of X-rays it is necessary to machine off layer after layer of the sample in order to expose to view any hidden defects. Even when this is done it remains for the experimenter to build up a mental picture of the defects in his casting on the basis of what he has seen on each of the exposed layers. From the radiograph it is possible to see all of these defects at once without destroying the casting. If it seems desirable, it is easily possible to make stereoscopic radiographs whereby the defects may be seen in their entirety and their depths easily estimated. Such a stereoscopic radiograph of a portion of the pure copper casting is shown in Fig. 4. This figure should be viewed through an ordinary stereoscope.

In view of the results shown above the X-ray examination of metals as a means of metallurgical research seems to have certain attractive and desirable features not found in other methods and to open a wide field for further work.

The Jennison-Wright Company, Toledo, Ohio, recently shipped 4164 yd. of Kreolite lug wood block to Dubois, Bennett & Son, general contractors on the American Locomotive Company's works, Schenectady, N. Y., to pave the floor of the boiler shop. Kreolite lug blocks were used because at times there was more or less water on the floor, and by using such blocks there would be no danger of the floor buckling or bulging. The floor is now laid and is giving perfect satisfaction.

Belgium's motor car factories and most of its iron and steel plants are intact, according to Consul Albert Holstead, of Birmingham, England. Belgium has occupied a most important position as a furnisher of castings, forgings and stampings for the motor industries of France, England and Italy.



Safety Handle for Wheelbarrow

than either the straight handle or the one with the plain guard so that it is an aid to efficiency as well.

A signal system for factory use known as the Ohio call system is being placed on the market by the Ohio Signal Company, Canton, Ohio. It consists of a small box with numbered keys connected to a system of wiring that reaches throughout the plant. The call box can be operated by a telephone operator or stenographer. By pushing the buttons bearing the proper numbers the call for a man wanted is sent throughout the plant and he is able to respond without delay. The signal can be given either in the form of taps on a gong or by means of an air or steam whistle. The system is also designed for giving a general alarm in case of fire.

MAKING TUNNEL SHIELD JACKS

Expeditious Method of Drilling and Tapping and Inserting Studs in Cylinders

In addition to other work in its shops, the Watson-Stillman Company, Aldene, N. J., has in course of construction 252 double-acting tunnel-shield jacks which are to be used in sub-aqueous tunneling in New York and Boston. The contracts for the jacks include the piping and valves for connecting them with the main pipe line, hydraulic accumulators and the erectors which are used for placing the cast-iron segments in position as the shield progresses. The shields are forced forward by the jacks.

The cylinders of the jacks are made from solid steel forgings which are drilled on a machine specially designed by the Watson-Stillman Company for boring hydraulic cylinders from the solid for its jacks and presses. The bore of the cylinders of the tunnel jacks is $8\frac{1}{2}$ in. in diameter and approximately 45 in. in depth. In Fig. 1, is shown the operation of inserting studs in the face of one end of a tunnel-jack cylinder. The machine is an American radial drill and the work is expedited by the use of a Wizard chuck made by the McCrosky Reamer Company, Meadville, Pa. The holes are drilled and tapped and the studs inserted without stopping the machine which operates at high speed. Within easy reach of the operator is a stand which holds the drills and taps when they are not in use.

Fig. 2 shows the finishing of rams for the jacks in a Norton grinding machine. Of the several rams piled in the foreground, some have been finished and others only machined. All of the rams are forged of steel.

Each of these tunnel shield jacks when in operation exerts a pushing pressure of 135 tons against the shield and as there are 17 jacks to each shield the total effective pressure for pushing the shield ahead is 2295 tons. The operating pressure is

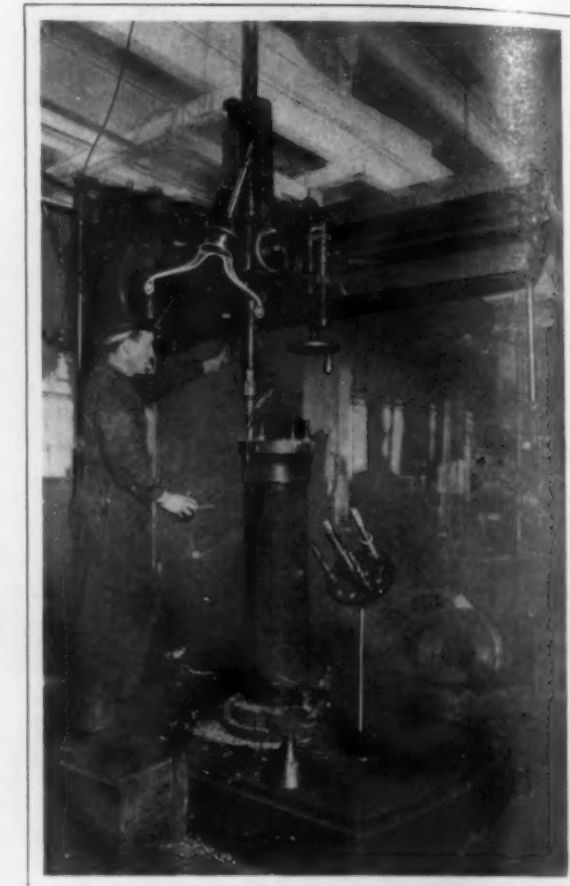


Fig. 1—Boring, Tapping and Inserting Studs in Cylinder at One Setting on an American Radial Drill

5000 lb. per sq. in. After placing a segment into place as a component part of the tunnel tube, the rams are returned into the cylinder by merely closing one valve and opening another which allows the hydraulic pressure to exert its force against the differential ram head. The ram, except at its head, is not the full size of the bore of the cylinder.

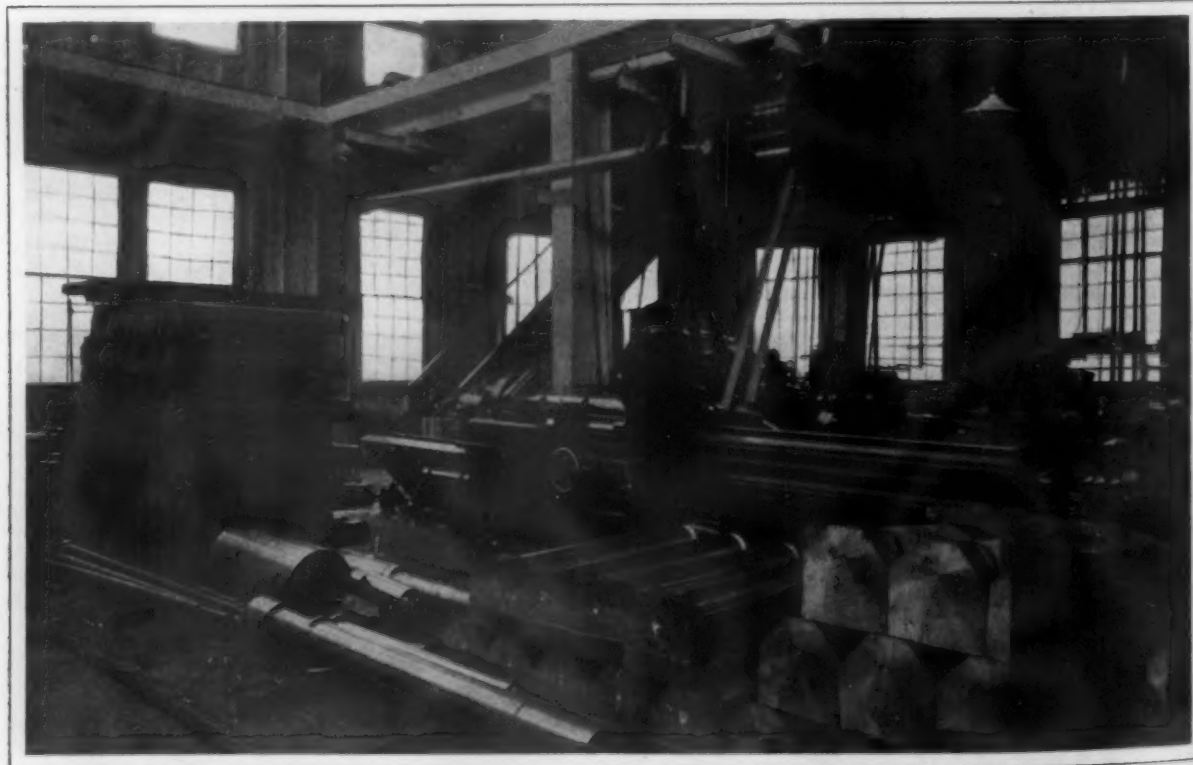


Fig. 2—Grinding Rams for Tunnel-Shield Hydraulic Jacks in the Plant of the Watson-Stillman Company, Aldene, N. J.

Duplex Cold Metal Cutting-Off Machine

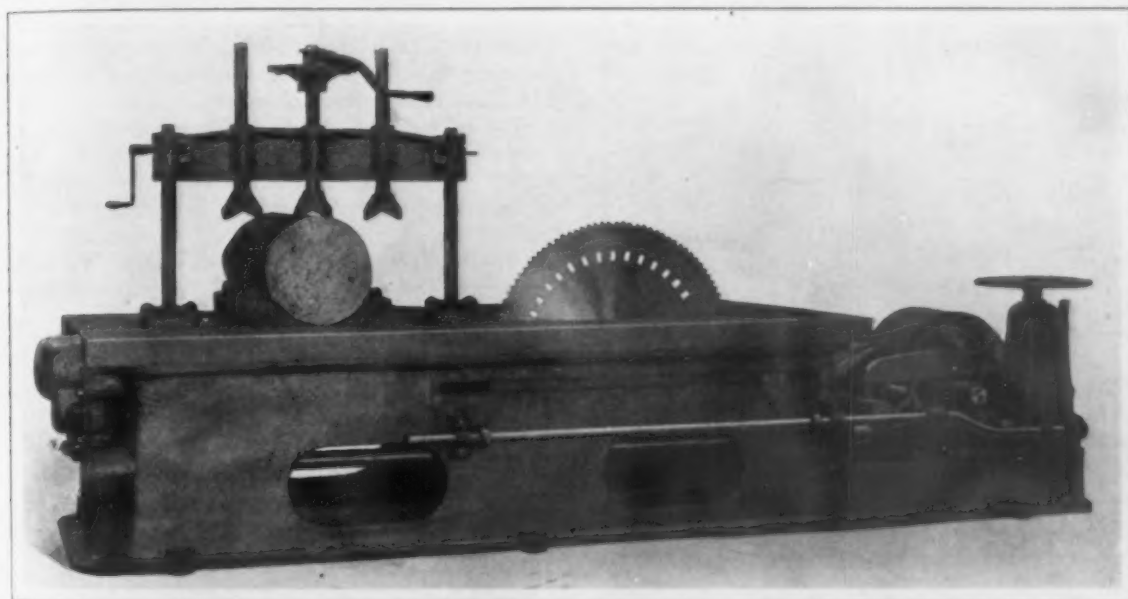
The Earle Gear & Machine Company, Stenton and Wyoming avenues, Philadelphia, Pa., has recently added a duplex type of cold metal cutting-off machine to its line. The new machine is designed for handling larger stock than is possible with the simplex machine, which has been built for some time, and has a capacity for cutting off stock up to a maximum diameter of 10½ in. The new machine uses two saw sprockets instead of the one employed in the earlier type. Hand or automatic control of the feed, which is provided on the latest type of simplex machine, are available in a somewhat similar form on the newer one.

In the duplex machine the blade is mounted in a carriage, which is pulled toward the work to be cut off, the work itself being clamped on a stationary table by V-blocks and holding-down screws. From the motor shaft the power is transmitted through a silent chain drive to a cross shaft, which

power, are mounted on the control shaft, while a handwheel mounted in a horizontal position enables the carriage and blade to be moved forward and backward by hand. A special safety device is relied upon to prevent breakage of the saw blade in case hard spots are encountered, offering a greater resistance to the blade than can be safely overcome. This device uses the friction between fiber and steel washers to transmit the power from the motor to the blade, and it is possible to control the amount of feed by varying the friction through an adjustable nut.

Requirements to Practice Industrial Engineering

The training, ability and experience required of a man if he would style himself an efficiency engineer or an industrial engineer are, briefly, in the opinion of Professor Hugo Diemer, professor of industrial engineering, Pennsylvania State College, as outlined in an address made some time ago before the Efficiency Society, as follows:



A Duplex Cold Metal Sawing Machine in Which the Saw Is Pulled toward the Stationary Table on Which the Work Is Mounted

in turn drives the longitudinal feed shaft and one for driving the carriage. The latter imparts a rotary motion to the blade through a set of gearing mounted in the carriage and the saw sprockets which are made of chrome nickel steel. These are located to engage radial slots in the saw blade at diametrically opposite points and transmit the power from the motor to the blade. It is pointed out that in this way the strain on the saw blade is distributed instead of being concentrated at one point. The sprockets are fastened to the end of the two spindles by tapered bores, which fit the conical ends of the spindles, are keyed in place and clamped with a nut and washer. Grinding is relied upon to secure proper contact between the spindle and sprocket, as well as interchangeability, this feature enabling a worn-out sprocket to be replaced readily.

Hand or automatic control of the feed is obtained through a gear box of the selective automobile transmission type. Six rates, ranging from ¼ to 1½ in. per min., are obtained from six sets of hardened spur gears running in an oil bath, the desired rate of feed being obtained by driving the feed shaft through any one of the six sets of gears. The engagement of the proper driving gear is secured by a conveniently located plunger. Two sets of clutches, one for feeding the blade forward, and the other to return the saw carriage and blade by

Eligibility to junior or full membership in one of the national engineering societies.

At least 3 years' experience in responsible charge of some phase of industrial management work.

The ability to pass an examination in industrial accounts with full reference to the interlocking of manufacturing accounts with the double entry accounting system.

He would suggest as the personnel of a committee to determine the right to use the title industrial engineer three men from the committee on management of the American Society of Mechanical Engineers, three men from the Efficiency Society, and three men from the Society to Promote the Science of Management. This committee of nine might be allowed to waive the examination in accounting in the case of applications from men who had done such work in systematizing and other higher classes of accountancy as in their judgment made an examination unnecessary.

In a recent race between a locomotive and an automobile the latter made the remarkable record of one mile in 25.2 seconds or 142.85 miles per hr., which is a little better than the best preceding record and is undoubtedly the highest speed ever attained by man on the face of the earth. The race was at Salduro, Utah, 112 miles west of Salt Lake City, the automobile traversing a crystallized salt bed 65 miles long and 8 miles wide and 98 per cent. pure, making a hard and absolutely level surface, offering almost no friction to the rubber tires.

A Two-Stage Combination Drawing Press

A Power Press of New Design—Double-Acting and Single-Acting Presses Combined with Automatic Work Carrier

A new type of drawing press in which the operations of an independent double-acting press are linked with the operations of a single-acting press by a revolving dial carrier which automatically transfers the piece being formed from one press to the other, the entire mechanism being built in

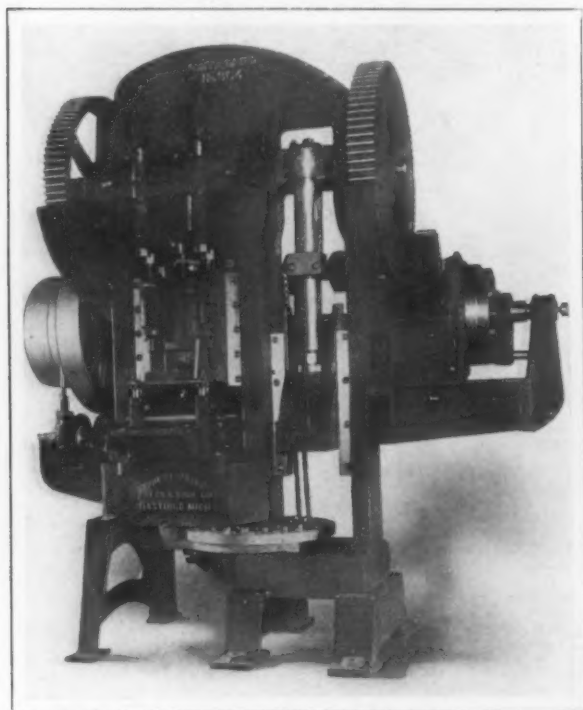


Fig. 1—Front View or Feeding Side of Automatic Combination Drawing Press

the one frame, is presented in the accompanying illustrations. The machine shown is one of seven different sizes built by the Consolidated Press & Tool Company, Hastings, Mich., and ranging in weight from 10,000 to 75,000 lb. The machine shown weighs 20,000 lb., occupies a floor space of only 5 sq. ft. and may be driven by a $7\frac{1}{2}$ -hp. motor. For any class of shell work for which drawing operations are required and where the nature of the work is such that it can follow through on a double-acting press, this combination machine, it is emphasized, presents advantages in the economy of floor space, labor and materials in its own construction, not heretofore attainable.

As is very clearly shown in the illustrations the frames of a double-acting press and a single-acting press have been combined in such manner as to eliminate one machine base and one upright column. Mounted on the central column of this framework, and revolving about it on ball bearings, is a steel dial made in sections so that it may be removed from the column without tearing down the machine. This dial is made with any desired number of openings, or receivers, arranged in a circle, the diameter of which is the center to center distance between the plungers on the double-acting and single-acting sides of the press. The location of the dial is such as to bring these openings directly under the die plate for the double-acting plungers and directly

above the die plate of the single-acting ram so that as the dial revolves the work when released may be dropped from the die directly into one of the dial openings, on the one side, and on the other from the dial into the die.

As indicated in Fig. 2 the dial is driven by a chain drive and sprocket on a lay shaft geared to the main shaft and then through a worm and worm-gear arrangement below the bed of the press. This drive not only fixes the relation of the dial rotation to the stroke of the plungers, in the timing of its operation, but, by virtue of the character of the drive, affords an evenly accelerated starting and stopping. At each stroke of the press the dial rotates that fraction of a complete revolution corresponding to the pitch of the openings in the dial. Thus at each stroke a piece is carried from the double-acting side and another piece, previously formed, is advanced into position for the single-acting operation, while between the two pieces actually in process there are the number of pieces half of the carrier dial will accommodate. Following the final operation of the single-acting plunger, the completed piece is ejected from the dial at the back of the machine, leaving the opening available for receiving another piece as it approaches the position under the double-acting plunger.

As shown in Fig. 1 this press is fitted with a roll-feeding device by which the strip steel from

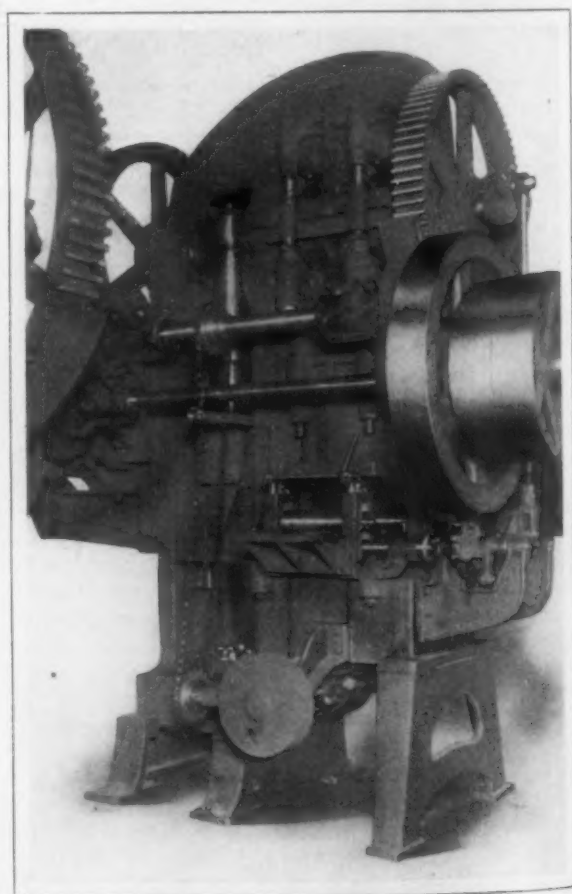


Fig. 2—Rear View of Automatic Combination Drawing Press Showing Drive for Dial

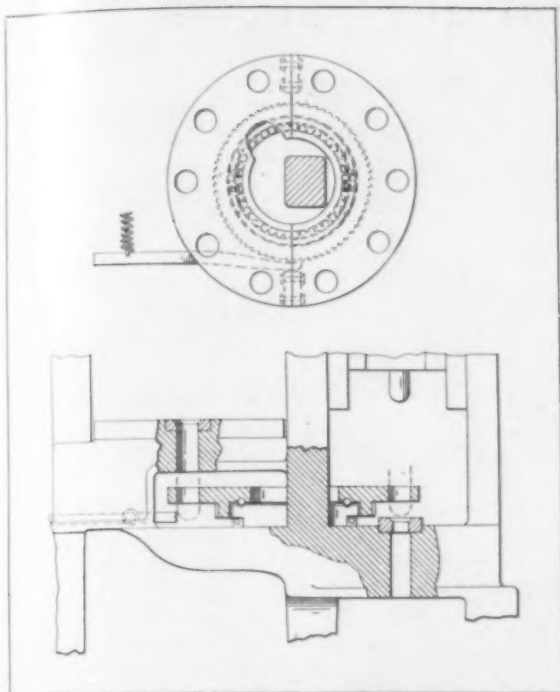


Fig. 3—Detailed Sketch of Dial Mechanism

which the parts are made is fed into the machine for the blanking operation on the double-acting side. Beginning with this feeding of the strip steel, the several operations required for the finishing of the piece are completely automatic. In Fig. 4 various types of drawn shell work, such as can be advantageously handled on a press of this type, are illustrated. The machine, of which views are shown here, has a capacity for making 15,000 complete shells per day, in connection with which no re-handling is necessary.

But one operator is required for this press and the labor, facilities and space ordinarily necessary for the transfer of semi-finished parts from one machine to another are of course obviated. It is stated that, as compared with similar work produced on single-acting presses, this machine has a production 25 per cent. greater and at the same time dispenses with five operators and helpers. This

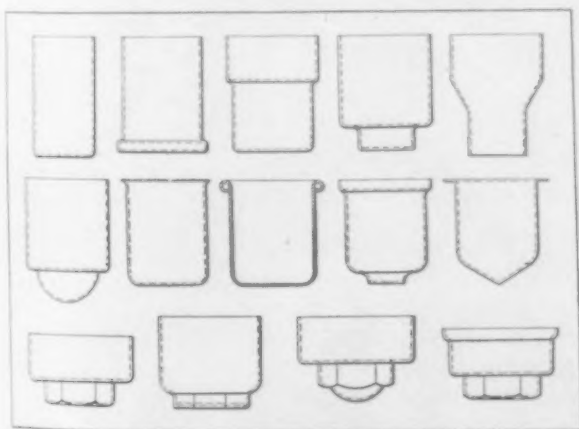


Fig. 4—Some Typical Examples of Work for Which the Press Is Adapted

combination press was designed and is built under patents held by Howard B. Sherman, Battle Creek, Mich.

Germany's total exports to the United States in 1914 amounted to \$156,776,804, compared with \$186,035,254 in 1913, a decrease of \$29,258,450, or 15.7 per cent. In the last 6 months of 1914 the exports were valued at only \$62,149,173, against \$100,686,625 for the same period in 1913.

Colorado Fuel & Iron Company's Affairs

At a meeting of the board of directors of the Colorado Fuel & Iron Company, held in New York City February 25, George J. Gould and L. M. Bowers resigned, but the vacancies were not filled. President J. F. Welborn presented a statement to the board which showed a deficit of \$496,481 for the first seven months of the current fiscal year, as compared with a deficit of \$579,611 at the corresponding part of the previous fiscal year, and a surplus of \$922,711 in 1913. He stated that the direct cost of the coal strike in Colorado to his company was \$464,000. The indirect cost, due to loss of business in the fuel department, is estimated at \$700,000 to \$800,000. The total direct and indirect cost was thus approximately \$1,250,000. The company's rail mill is now producing 600 tons per day, or at the rate of 15,000 tons per month, and with orders on hand can continue on that basis to and including the month of May. The demand for merchant bars and spikes and all kinds of rail accessories is low and at prices that return little or no profit. Wire and nail orders are showing some improvement and a good spring trade is hoped for with some increase in prices. To provide as much work as possible for the operating force, two blast furnaces have been kept at work, which have accumulated 31,000 tons of pig iron in the past six months. The company's mine employees are now better satisfied and have a more friendly feeling toward the company than they ever had before.

Baldwin Locomotive Works Has Bad Year

The Baldwin Locomotive Works, Philadelphia, has issued its report for the year ended December 31, 1914, which, in common with the experience of numerous other large manufacturing companies, shows a deficit. The gross sales for the year aggregated \$13,616,163, against \$37,637,969 in 1913. The deficit, after the payment of dividends on both classes of stock, was \$1,449,770, against a surplus the previous year of \$2,217,800. The surplus at the close of the year was \$3,438,021, against \$4,887,791 at the close of the previous year. President Alba B. Johnson, in his accompanying remarks, attributed to the unfavorable attitude of the Interstate Commerce Commission the falling off of railroad revenues in the latter part of 1913 and first half of 1914, which caused a general cessation of purchases of railroad equipment, and this condition was made more acute by the reduction of railroad revenues resulting from the slowing down of business due largely to the adoption of lower tariff rates. In the last half of 1914 these unfavorable conditions were further affected by the paralysis of finance and business following the breaking out of the war in Europe. The stress of competition forced the prices of orders secured close to the cost of production. He states that the business outlook at the beginning of 1915 is somewhat more favorable, but there is nothing to indicate more than moderate activity in the first half of the year.

The Schumachar Briquettes

The Schumachar briquetting process is the subject of a recent patent (U.S. 1,121,048—December 15, 1914) granted to William Schumachar, of Osnabrück, Germany. Finely divided iron ore, in which the iron is in a low state of oxidation, compressed with a catalytic agent such as calcium chloride is claimed to effect the conversion of the iron compound into a higher state of oxidation and to produce briquettes suitable for the blast furnace. The claim of the inventor is that where flue dust containing the lower oxides of iron is briquetted with a catalytic agent, sound briquettes are the result, the iron becoming oxidized. His proposition is to reduce fine iron dust ores with coal dust and then briquette them after mixing with lime. The mixture of coal and ore is heated to 500 or 600 deg. C. or to a lower temperature, 400 to 500 deg. C. when it may be treated with carbon-monoxide gases. Reduction is said to result in either case and the product ready for mixing and briquetting. By the use of great pressure the admixture of a catalytic agent may be unnecessary, it is said.

Hysteresis Loss in Medium-Carbon Steel*

The Structure an Important Consideration—Large Grains with Coarsely Laminated Pearlite Insure Minimum Loss

BY F. C. LANGENBERG AND R. G. WEBBER

During the course of some magnetic investigations which the authors have under way, six bars of 0.43-carbon steel were tested, a permeameter designed after the Hopkinson yoke type being used. The results obtained were of some interest and although far from complete serve at least to show the necessity for a careful investigation of the previous history of the samples under study as well as the chemical composition.

A steel of given chemical composition may assume a great variety of structures, depending on its treatment. Professor Sauveur has devised a very clear and effective means of illustrating this point. The accompanying photomicrographs show some of the possible structures assumed by a 0.30-carbon steel (Fig. 1).

It is now a well-established fact that a structural change is accompanied by changes in the tensile strength, elastic limit, hardness, etc., and it seems reasonable to assume also, a change in the magnetic properties.

Six bars of a 0.43-carbon steel were used, all the bars being taken from the same rod and treated as follows:

Bar 1. Heated to 1100 deg. and cooled in the furnace.

Bar 2. Heated to 1000 deg. and cooled in the furnace.

Bar 3. Heated to 900 deg. and cooled in the furnace.

Bar 4. Heated to 1000 deg. and cooled in air.

Bar 5. Heated to 900 deg. and cooled in air.

Bar 6. Untreated.

The bars were then turned to 13 mm. diameter and tested by the Hopkinson yoke method. After testing, three specimens were taken from each bar, one from each end and one from the middle. The homogeneity of the bars was tested in this manner and in no instance could any difference in structure be detected between the three specimens.

Bars 1 to 3 inclusive, Figs. 2, 3 and 4, are pearlitic in structure. The white areas are ferrite (iron

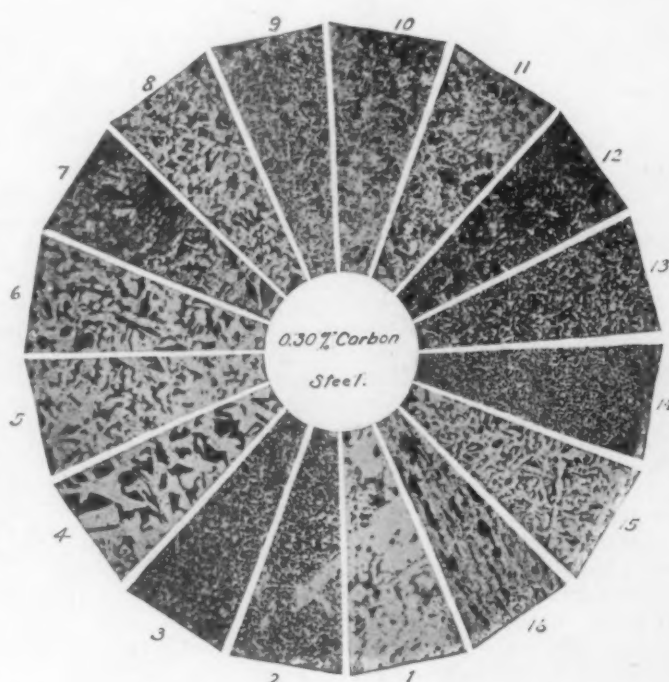
with certain impurities in solution) and the dark areas pearlite (the eutectoid of Fe₃C and ferrite). Bar 1, Fig. 2, has a coarser structure than bar 2, Fig. 3, and bar 2 in turn a coarser structure than bar 3, Fig. 4. Bar 6, Fig. 7, is also pearlitic and is similar in every way to bars 1, 2, 3, except that its structure is very fine. Bar 6 was the untreated specimen and represents the structure of the material as it came from the rolls. Bars 4 and 5, Figs. 5 and 6, have an entirely different structure. On

passing through the critical range on cooling the ferrite has been rejected to the boundaries of the grains and the dark portions in these samples are a mixture of pearlite and sorbite. Sorbite can be regarded as poorly defined pearlite and is one of the transition constituents between austenite, existing above the critical range, and pearlite, below the range. Bar 4 is more sorbitic than bar 5 and also has a larger grain.

The hysteresis loss was determined as follows: The area of the loop inclosed by the B-H curve was measured by a planimeter. The co-ordinates being in absolute units, the resulting area as determined by the planimeter was multiplied by our scale constant, which was 40,000, and divided by 58, 58 c.c. being the volume of the bar tested. Residual curves were

not determined, but for each bar the residual induction B was determined after the magnetizing force H had reached its maximum. The coercive force was determined by measuring the magnetizing force H necessary to reduce residual B to zero. Hardness of the specimen was measured by a Brinell machine and results are expressed in Brinell hardness factors.

Bars 1, 2, and 3 present a very interesting study.



1. Steel as cast.
2. Steel cast and imperfectly annealed (remnants of ingotism).
3. Steel cast and properly annealed.
- 4-8. Heated to various temperatures above critical range for various lengths of time and slowly cooled in furnace. Ferrito-pearlitic structures of different degrees of coarseness.
- 9-13. Heated above critical range, followed by cooling in air or oil, or heated above critical range, cooled in water or oil and reheated to 600 deg. C. Ferrito-sorbite or ferrito-sorbite-pearlitic structures.
14. Forged and finished at low temperatures.
15. Forged and finished at high temperatures.
16. Cold worked.

FIG. 1.—VARIOUS STRUCTURES OF MILD STEEL (0.30 PER CENT. C). (A. SAUVEUR.)

Bar No.	Loss in ergs per cc.	Residual B	Coercive force	Brinell hardness
1	17,280	6,700	3.65	131
2	18,240	6,800	3.70	131
3	21,920	7,000	3.72	131
4	26,240	7,700	7.00	140
5	25,760	7,300	7.00	131
6	29,120	9,700	7.50	131

*A paper prepared for the New York meeting of the American Institute of Mining Engineers, February 15 to 17. Mr. Langenberg is assistant in metallurgy, Harvard University, and Mr. Webber is instructor in physics and electrical engineering, Ohio University.

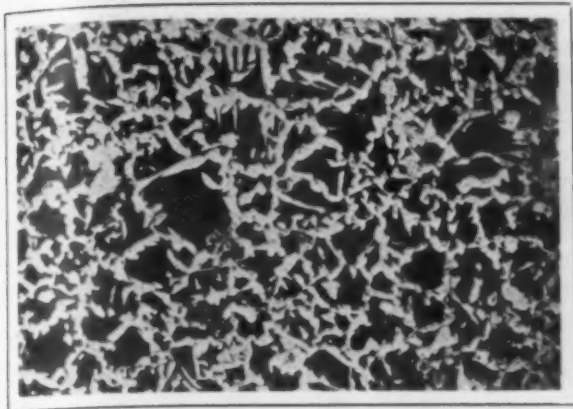


Fig. 2—Bar 1—Hysteresis Loss, 17,280; Residual B, 6700; Coercive Force, 3.65; Hardness, 131

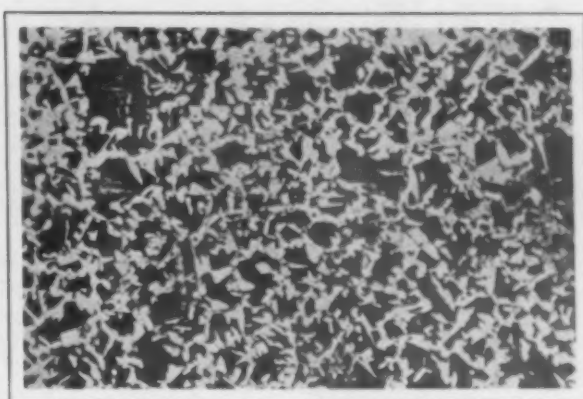


Fig. 3—Bar 2—Hysteresis Loss, 18,240; Residual B, 6800; Coercive Force, 3.70; Hardness, 131

The only variable factors in these three bars are the relative size of grain and the coarseness of the striations of pearlite. Bar 1 has a large grain and the pearlite is coarsely laminated. Its hysteresis loss per cubic centimeter was 17,280. Bar 2 has a finer structure than No. 1, and shows a hysteresis loss of 18,240. Bar 3 is still finer than bar 2 and shows a loss of 21,920.

Bar 6, as before stated, is also pearlitic and differs from bars 1, 2, and 3 in having a much finer structure. The hysteresis loss in this bar rises to 29,120 ergs per c.c., which is 68 per cent. greater

than bars 1, 2, and 3. The finer structure of bar 5, however, is only apparent and not real. The gross structure is finer—that is, the grains are finer—but the structure as revealed under higher magnification shows that bar 4 is composed of sorbite, laminated pearlite being almost entirely absent. In bar 5 considerable laminated pearlite is present.

SUMMARY OF THE RESULTS

1. Bars tested, six in number, carbon content,

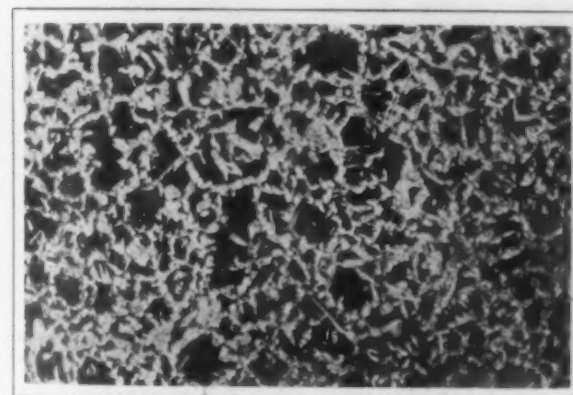


Fig. 4—Bar 3—Hysteresis Loss, 21,920; Residual B, 7000; Coercive Force, 3.72; Hardness, 131

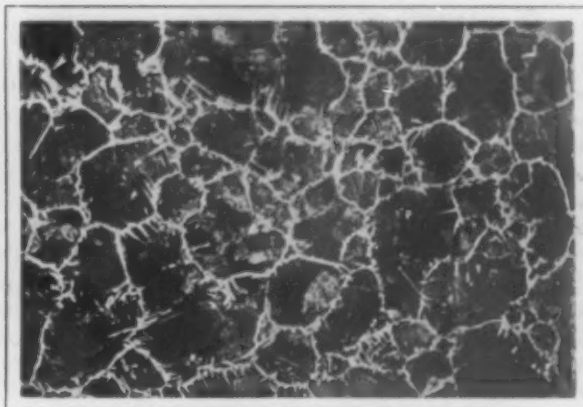


Fig. 5—Bar 4—Hysteresis Loss, 26,240; Residual B, 7700; Coercive Force 7.00; Hardness, 140

than the loss in bar 1. It is to be borne in mind that both are in the unhardened condition.

Bars 4 and 5 show an entirely different structure to any of the other bars. Bar 4 has a larger grain than bar 5, but the treatment employed to give the bar its coarse structure also produced a larger proportion of sorbite than is present in bar 5. Bar 5 has a hysteresis loss 480 ergs less than bar 4, which seems contradictory to the results shown by the pre-

0.43 per cent. Bars 1, 2, 3, and 6 were pearlitic and bars 4 and 5 were sorbitic.

2. With decreasing grain size bars 1, 2, 3, and 6 show a rise in their hysteresis loss, increasing residual B, and increasing coercive force.

3. Bar 4, comparable in grain size to bar 1, but differing from bar 1 in being sorbitic whereas bar 1 is pearlitic, shows an increase in its hysteresis loss of approximately 50 per cent.

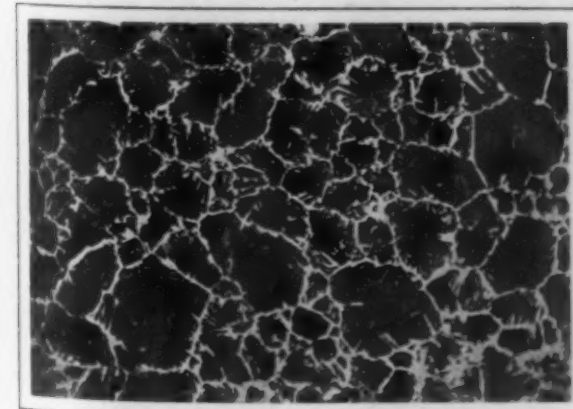


Fig. 6—Bar 5—Hysteresis Loss, 25,760; Residual B, 7300; Coercive Force, 7.00; Hardness, 131



Fig. 7—Bar 6—Hysteresis Loss 29,120; Residual B, 9700; Coercive Force, 7.50; Hardness, 131

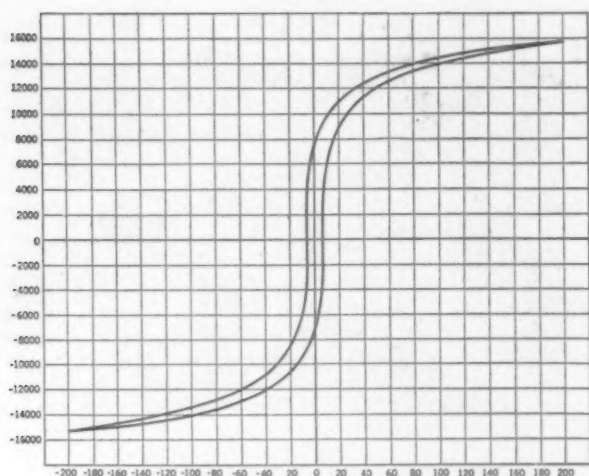


Fig. 8—The B-H Curve for the Specimen Represented by Fig. 2, Bar 1, Showing How the Hysteresis Loss Was Measured in Each Case. Loss Here Was 17,280

4. In magnetic testing careful attention must be given to the internal structure of the metal undergoing test. A mere statement of its condition as hardened or unhardened, annealed or tempered, is idle and often misleading.

5. Our results lead us to infer that a minimum hysteresis loss could be obtained by the combination of large grains with coarsely laminated pearlite.

Record Size Gas Blowing Engine

The largest single tandem gas blowing engine ever constructed in the United States was recently on exhibition at the works of the Mesta Machine Company, West Homestead, Pa. The gas cylinders are 46 in. in diameter, the air cylinder 84 in. in diameter and the stroke 60 in. The engine will run at a speed from 45 to 85 r.p.m., depending on operating conditions. The accompanying illustration shows the gas engine on the erecting floor at the Mesta works, but will give a good idea of how the engine will appear at the plant of the Pennsylvania Steel Company, Steelton, Pa., for which it was built.

The air end is equipped with Mesta automatic plate valves of the Iverson patent, which require no valve gearing. The use of these valves has made possible the placing of the air cylinder directly back

of the gas cylinders, so that the air cylinder piston can be directly driven through an extension of the gas cylinder piston rod. This arrangement is to be contrasted with that of placing the air cylinders on the opposite end of the bedplate to that taken by the gas cylinders. The engine is of the center crank type. A double bearing bedplate is used with this crank and results in an equal distribution of the stresses.

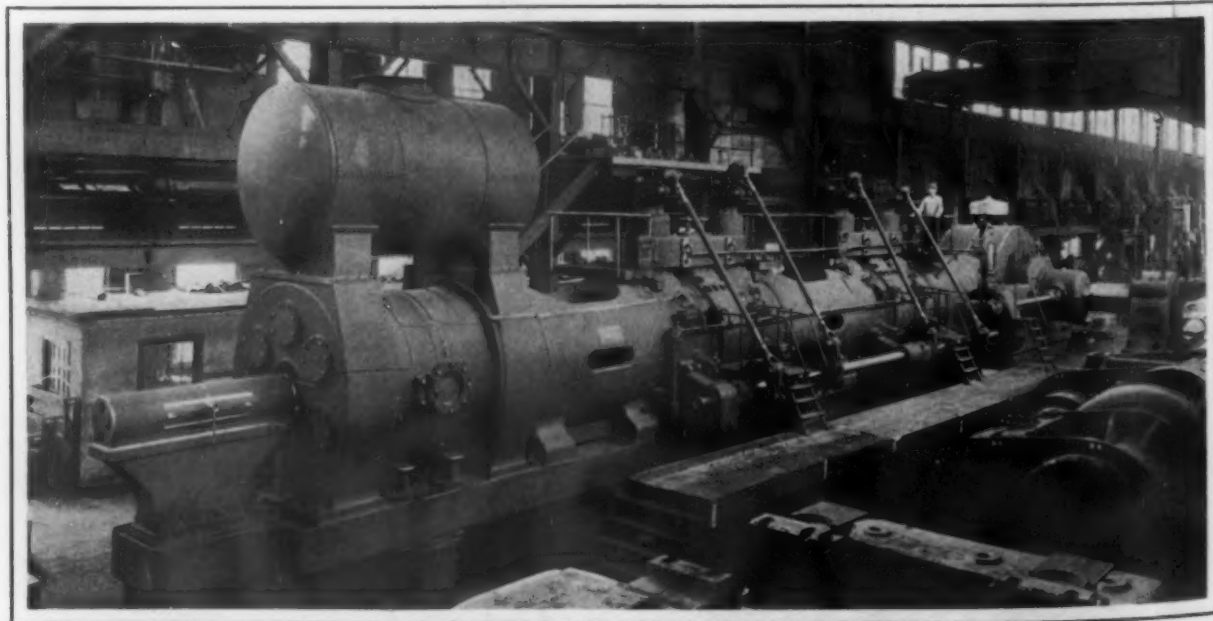
At the present time a duplicate unit is being built in the Mesta works, and details with test results are promised as soon as the engines are put in operation.

Important Chemical Processes Discovered

Secretary of the Interior Lane announces the discovery by the United States Bureau of Mines of two chemical processes, one of which, it is claimed, will greatly increase the supply of gasoline while the other may make the United States absolutely independent of the rest of the world in regard to important materials necessary for the dye industry and the manufacture of high explosives used in warfare and in engineering operations. The first of these processes promises to enable the independent oil refiners to increase their output of gasoline from 12,000,000 barrels in a year to 36,000,000 barrels, or greater than the total production today from all sources. The second process includes the manufacture from crude petroleum of what is known chemically as toluol and benzol, both of which have heretofore been obtained from coal tar, and are the important bases for the production of dye stuffs and high explosives, especially smokeless powder.

The discoverer of these two valuable processes, after many years of research, is Dr. Walter F. Rittman, chemical engineer of the Bureau of Mines. The work was done at Columbia University, New York, the facilities of the laboratory there having been turned over to the Federal Government by President Nicholas Murray Butler. Application has been made by Dr. Rittman, on behalf of the Federal Government, to patent these processes in order to prevent any monopoly in their use, the patents to be dedicated to the whole American people.

The Bureau of Foreign and Domestic Commerce, of the Department of Commerce, has issued a pamphlet of 29 pages, entitled "Consular Recommendations on South American Trade." It is known as Miscellaneous Series No. 20, and is being distributed at 5 cents a copy by the superintendent of documents, Government Printing Office, Washington, D. C.



Single Tandem Gas Blowing Engine Built for Pennsylvania Steel Company by Mesta Machine Company

A 10-Ton Tractor for Horse Trucks

A 10-ton tractor for converting a horse-drawn vehicle into a motor truck has been developed by the Knox Motors Company, Springfield, Mass. Among the new features that are embodied in its construction are hydraulic brakes, an interlocking differential lock, an interesting type of brake for the jackshaft which can be readily adjusted and have renewal of the shoes made, and an automatic locking device for the last. With this tractor the drive is from the rear axle and the trailer in reality becomes a power-driven vehicle with a front-wheel drive. The driving wheels, it is pointed out, are pulling a heavy load and pushing a light one in front of them which simply acts as a steering feature.

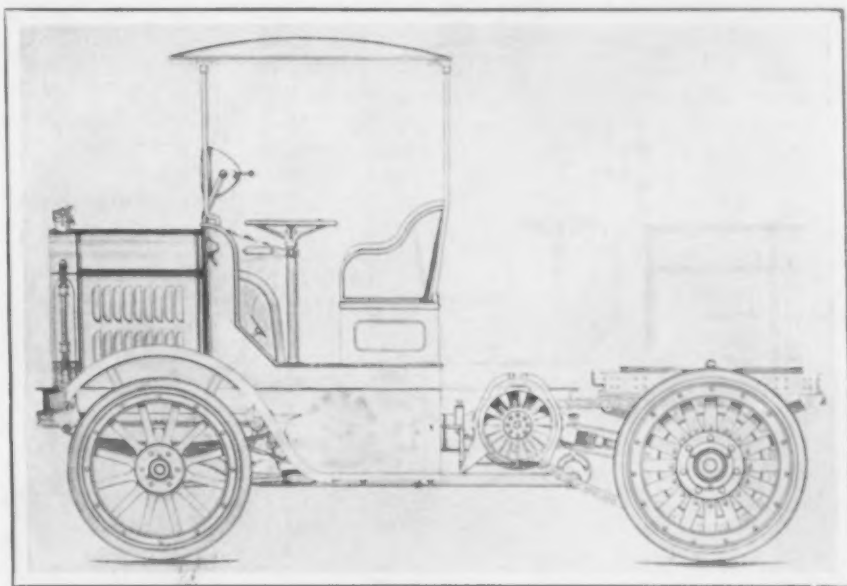
It will be noticed from the accompanying illustration that the frame of the chassis, which supports the transmission, motor, body, etc., does not extend to the rear axle, and this member is entirely isolated. The cantilever springs supporting the chassis proper are resting at their rear ends in slideways under the rear axle, which is driven by the driving chain, while the strut rods maintain it in line. In this way it is pointed out that the rear axle is at liberty to move up and down equally or unequally as to either of its wheels without imparting motion to the remainder of the tractor. The rear axle rotates in the rear bracket of the strut rods and as the springs supporting the trailer platform are fastened to the rear axle itself, the former can remain parallel with the body of the trailer under all conditions and also give full support to the front end of the trailer by the circle plate. A draw bar device with springs is relied upon to maintain the trailer platform in a horizontal position when the tractor is running separately.

The motor is of the four-cylinder type, and the cylinders, which are 5 in. in diameter with a $5\frac{1}{2}$ -in. stroke, are cast in pairs. The motor will develop power to a speed of approximately 1000 r.p.m., but beyond that point the power will diminish, the theory being that when running under full load the speed will be limited by this design, but the tractor may be driven at a higher rate of speed without damage when running without load. The valves are located in the heads bolted to the cylinder without the use of valve cages, and the circulating water passes through U-shaped castings bolted to the side.

The transmission is of the selective type with three speeds in either direction, secured through a center control. The interlocking differential lock which is incorporated in the transmission is operated by a heel button in the floor at the driver's seat. This lock cannot be used unless the transmission gears are in the neutral position, thus, it is pointed out, eliminating breakage of the locks. After engagement any speed in the transmission may be used.

The foot brake pedal is automatically locked when desired and operates on the jackshaft through cast-iron shoes against cast steel drums, 14 in. in diameter with a 4-in. face, which are provided with a number of cooling ribs to radiate heat. The hand

brake, which operates the hydraulic pump, operates in the same manner as the ordinary hand brake and is designed to hold the tractor on a grade. Hydraulic cylinders are bolted to the strut rods and operate on the brake levers at the rear axle. These



An Improved Form of Road Tractor for Converting a Horse-Drawn Vehicle into a Motor Truck

brakes are of the internal application type and are 20 in. in diameter with a $6\frac{1}{2}$ -in. face.

Tin-Plate Trade of Wales

When the history of the tin-plate trade and the effect caused by the war comes to be written it will be found that it has suffered as much as any other trade which relies in normal times upon extensive European markets, of which Germany itself forms no inconsiderable part, says United States Consul C. L. Livingston, of Swansea, Wales.

When the war broke out this trade was in anything but a flourishing condition, plates 14 x 20 were then commanding 13s. 3d. (\$3.22) a box, and notwithstanding the rise in bars and tin since, they are only today (January 29) able to command from 13s. 9d. to 14s. (\$3.35 to \$3.41) a box, and at that figure business is not large. Tin bars in the period under survey have risen 15s. (\$3.65) a ton, and this alone proves an instructive lesson, for a rise of 5s. (\$1.22) a ton in bars alone means an extra cost of $3\frac{1}{2}$ d. (7 cents) per box. Thus plates have not risen commensurately to cover the extra cost of this raw material. Tin has risen by leaps and for every £10 (\$48.67) per ton advance it costs 3d. (6 cents) per box of tin plates to produce.

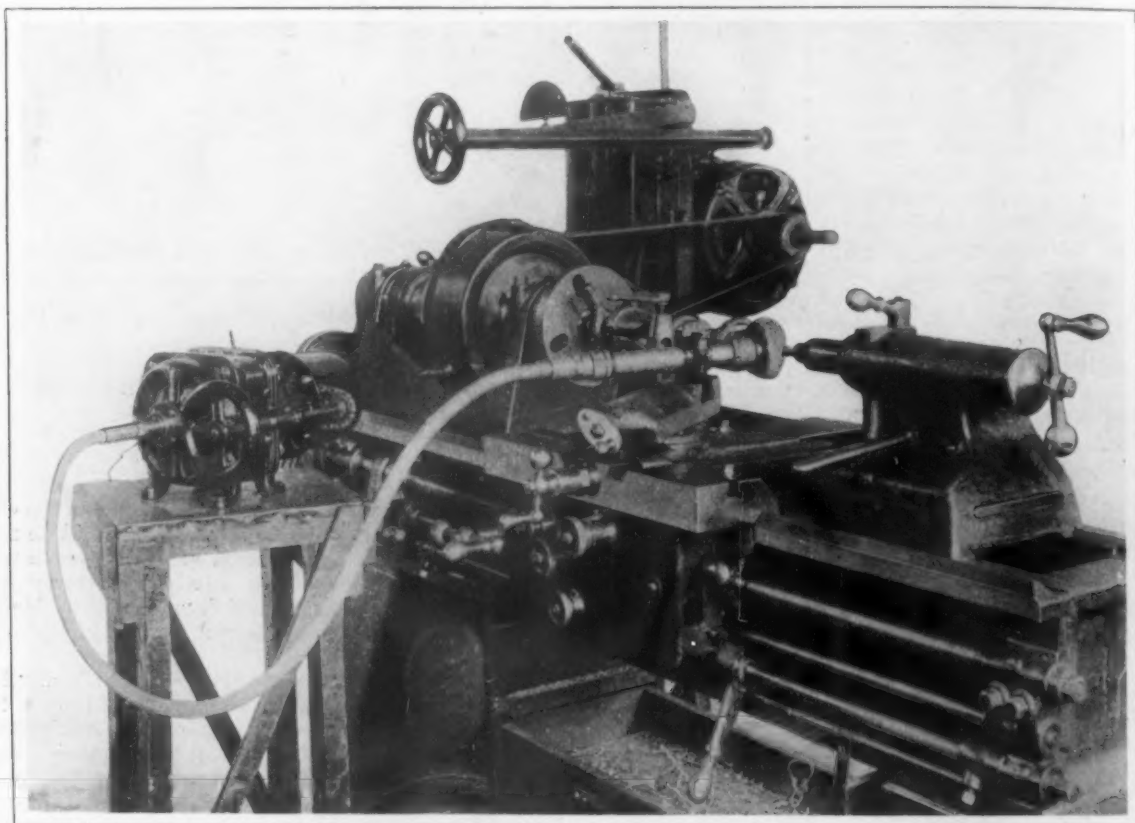
The pooling arrangement in the tin-plate trade has not come any too soon; it has worked well in the sheet trade. Though it is as yet too soon to judge the results there is every indication the system will work advantageously to makers. This system only came into active operation on January 4 of this year, and by its production has been restricted, each works being allotted an output on the basis of six months' working, those making in excess contributing into the pool and those making less receiving from the same source. The moneys which will be received will not be sufficient to compensate for idle mills, though it will minimize the expenses, it being far better for works to keep going at their fullest capacities and contribute toward the cost of their less fortunate neighbors.

The value of the tin plates invoiced at the American consulate at Swansea for shipment to the United States last year was \$371,244, an increase of \$317,640 over 1913. The exportation of tin plates from the United Kingdom for 1913 and 1914 were \$35,111,739 and \$29,204,972, respectively. In the war period, August to December inclusive, the exports were \$13,690,200 in 1913 and \$8,808,122 in 1914.

Variable Speed Alternating-Current Motor

A new adjustable-speed alternating-current motor has been brought out by the Kimble Electric Company, Chicago, Ill. The speed can be varied by small gradations under loads varying from no load to the rated capacity of the motor. The speed variation is controlled by a handwheel which is connected by a chain or shaft to a governor located on the chain. The motor may be used on lathes, drilling, milling and grinding machines, etc. In the accompanying illustration two types of transmission are shown, as well as the regular use of the motor and one furnished with a flexible shaft for driving a grinding wheel. The range of speed

or next to the largest step of the cone pulley, and it is pointed out that in this way all of the required speeds can be secured, and at the same time all motor vibration is kept away from the driven machine. In the other type the motor is mounted on the rear of a swinging frame which is attached to the floor by a hinge at the lower end, so that the whole assembly can be moved toward or away from the lathe to adjust the belt tension, the adjustment being made, as required, by an adjustable distance piece. With this mounting, the controller is located on the front of the frame. All of the attachments required, such as the sprocket, chain, speed adjustment wheel, shaft and bracket and two stop, start and reverse levers with shafts and



A Lathe Equipped with Two New Adjustable-Speed Alternating-Current Motors, the Speed of Which Is Changed in Small Steps by Manipulating a Handwheel That Transmits the Change Through a Chain and Sprocket or a Shaft

of the motors is regularly 3 to 1, 600 to 1800 r.p.m., although in the smaller motor, this can be doubled.

In some respects the motor resembles a direct-current unit in which multi-voltage control is used. Dynamic braking is employed to secure a quick stop, and this is a point wherein the motor differs from those of the direct-current type, it being emphasized that it is possible to turn over the motor by hand at a low speed without bringing the brake into action. This enables the spindle to be turned by hand when a piece is being chucked in a lathe without encountering resistance from the dynamic brake. The motor is built in sizes ranging from 1/6 to 2 hp., and in sizes above 3 hp. an outside controller, giving forward and reverse speeds and dynamic braking is furnished, while in the smaller sizes a double-pole, double-throw switch is used instead.

Two types of mounting are supplied, in one of which the motor is set on slide rails on a flat top pedestal fastened to the floor. The controller is located on the side of the pedestal, and the space within the pedestal body is provided with shelves for storing tools, etc. The motor is belted to the largest

brackets for attaching to the frame of the machine, and the connecting link between the apron and controller are included with the motor.

The Chapman Engineering Company, Mt. Vernon, Ohio, reports considerable improvement in the gas-producer trade. A noteworthy order is from the Irtys Corporation, London, England, for two 10-ft. Chapman rotary full mechanical producers, to be installed in a zinc smelter at Ekibastous, Siberia. The New Jersey Zinc Company has bought four producers of the same type for its plant at Palmerton, Pa., to gasify anthracite. A Chapman rotary top on an old hand-poked producer, in the plant of the American Bottle Company at Newark, Ohio, has doubled the capacity of the producer, materially improved the quality of the gas and reduced the poking to the regular breaking-down and ash removal periods.

The Hess-Bright Mfg. Company, Front street and Erie avenue, Philadelphia, Pa., states that notwithstanding reported obstacles to the importation of ball bearings, it continues to receive great quantities from its Berlin works. The total since September 15 is 375,000 bearings of assorted sizes, one large shipment now being en route.

Hand-Operated Hole Grinding Machine

The Rivett Lathe & Grinder Company, Brighton, Mass., has added to its line a hand-operated small hole grinding machine, designed to finish work where the highest quality of finish is not the primary consideration, or for roughing work which may be finished on the company's No. 3 grinding machine. This tool can also be used to advantage for all internal grinding work within its range, requiring so short a time that to employ a mechanically operated machine would be a less economical practice. The same accuracy is preserved in the processes of its manufacture as in all previous types of Rivett grinding machines.

The headstock spindle is of tool steel, hardened and ground, running in tool steel bushings also hardened and ground. The grinding wheel spindle is of an improved type and runs in ball bearings. The countershaft contains several new features and is simpler and more efficient than the former type. The workhead and pump are controlled by a pedal so that the work spindle may be stopped without interrupting the grinding wheel spindle. This pedal also actuates a band brake which brings the work spindle to rest as soon as the belt is disengaged, thus affording protection to the operator and saving a considerable amount of time.

The headstock is mounted on a table operated in its movement to and from the grinding head by a pilot wheel through the medium of a rack and pinion of the herringbone type. Means are provided for compensating for any wear of these parts. The headstock is arranged to swivel and the base is graduated to permit of adjustment for grinding taper holes. The headstock is locked in its normal position by a taper plug. The headstock table is provided with stops to govern its travel and a bumper absorbs the shock at the end of its travel when it is moved away from the grinding wheel spindle.

The grinding spindle and its countershaft are mounted on a cross slide provided with a hand feed for accurate location of the spindle. The spindle has a total movement of 3 in., 1 in. in front of the center and 2 in. back. The slide consists of two parts, one above the other, so that the upper slide can be pushed back 4 in., allowing the operator unobstructed access to the work, for gauging and chucking. A carefully designed locking mechanism holds the upper slide securely in place. This arrangement saves the operator considerable time and insures positive alignment. Here also a bumper is provided to prevent shock when the slide is pushed back.

The grinding spindle countershaft is mounted in standard ball bearings, and drives the grinding spindle through an endless cloth belt. The belt tension between these parts is regulated by a spring, the tension, therefore, not being left to the discretion of the operator.

The specifications of the machine are as follows:

Maximum swing, in.	7
Longitudinal travel of work head, in.	4 1/4
Cross movement of wheel spindle, in.	3
Minimum distance from shoulder on work spindle to face of grinding spindle wheel bracket, in.	1 1/2
Work spindle speeds, r.p.m.	300-590
Grinding wheel spindle speeds, r.p.m.	11,200-15,400-21,400
Speed of overhead countershaft, r.p.m.	600
Diameter of countershaft pulley, in.	6 1/4
Speed of pump, r.p.m.	490
Floor space required, in.	29 x 37 1/2
Approximate weight, lb.	1,000

The countershaft is of improved design, compact and self-contained. Its shaft runs in ball bearings. It furnishes three belts to the machine, for the workhead, for the grinding spindle countershaft and



A Recently Developed Machine for Grinding Small Holes in Which the Work Spindle Can Be Stopped without Interference with the Grinding Wheel Spindle

for the water pump. A drum takes care of the travel of the work spindle and an idler pulley provides a constant tension of the belt to the grinding spindle countershaft regardless of the position of the slide.

Composition of Engine Castings

The standard composition of British engine castings is given as follows by Frank Foster in his paper, entitled "Essential Principles of Engine Design," read before the Manchester (England) Association of Engineers:

	Steam cylinders	Frames	Flywheels	General
Total carbon, per cent.	2.90	3.30	3.50	3.50
Combined carbon, per cent.	0.90 to 0.95	....	0.37	....
Silicon, per cent.	1.10 to 1.30	1.60	2.00	1.70 to 2.20
Manganese, per cent.	0.60 to 0.90	0.65	0.40 to 0.50	0.30 to 0.40
Phosphorus, per cent.	0.40 to 0.60	0.50	0.90	0.40 to 1.40
Sulphur, per cent.	0.15	0.15	0.15	0.15
Transverse load, cwt.	35 to 46	34 to 38	30 to 33	29 to 32
Transverse deflection in inches.	0.50	0.50	0.35 to 0.45	0.30 to 0.50
Tensile strength, tons per sq. in.	12 to 14	11 to 13	11 to 14	9 to 11

The Pittsburgh Iron & Steel Foundries Company, Midland, Pa., manufacturer of Adamite steel rolls, castings and ingot molds, is calling attention to the high-efficiency product and service it offers, through the distribution of a series of attractive cards, 3 1/4 x 5 1/2 in., suitable for desk or wall mounting. The message on each card is an excerpt from the philosophy of efficiency.

The Cleveland Crane & Engineering Company and the Cleveland Punch & Shear Works Company, Wickliffe, Ohio, have moved their New York office from room 825 at 30 Church street to suite 1578 at the same address.

MISUSING HOLIDAYS

A Phase of the Occupational Disease Question Not Commonly Considered

BY H. D. MURPHY

The occasional articles which are written upon occupational diseases indicate that this matter is now getting the attention which has long been wanting. However, almost everyone in the discussion of this subject is proceeding on a false assumption through failure to consider some of the most vital points in connection with it.

In the first place, the cause and effect of these diseases is studied only in the shop. At least, this is true of manufactories. Just as close attention should be given to the health of the clerks. The work of bookkeepers and other office employees is just as confining as that of the workman. In fact, the clerical position is altogether sedentary, whereas the operation of a machine brings into play more muscles and causes less hurtful compression of various organs.

MACHINERY'S BOON TO BOTH OFFICE AND SHOP

Another point to which very little if any attention has been given was strongly emphasized a short time ago by one who has had large experience in sanatorium work. He said that "it is not so much what these people do during the working hours that counts but what they do afterward." Hardly as long as a generation ago the labor of the workman was much more arduous than at present. The strides made in producing machinery which lightens actual physical effort are comparatively recent. Also in those days the clerks frequently worked over their books night after night, not having the advantage of the computing and writing machines which are now so common. Even the indoor salesmen were supposed to be busiest when other people were homeward bound.

For all of these, by the time their day's work was done, there was time for little else but eating supper and seeking a downy couch. Notwithstanding, the holidays and other spare hours were spent in outdoor recreation. There was a fondness for those pastimes which hardened the muscles and stimulated the circulation of the blood, all of which kept everyone more fit for the strain of his particular occupation. It cannot be said that we make the same good use of our spare hours nowadays and yet we have more of them. The shortened working day, the Saturday half-day and the more numerous holidays, together with a more liberal attitude as to the Sabbath being made for man should result in sufficient indulgence in healthful recreations to offset, in fact, to prevent any deleterious effects from either trade or office pursuits.

NOT GOOD USE OF HOLIDAYS

On the contrary, those of us who can afford it, or think we can, luxuriate far too much and those who cannot simply become lazy. The artificial stimulus of a theatrical production or the soft seat in a friend's car take the place of a brisk walk in the open country; or the dimly lighted motion-picture show proves more alluring than a rousing ball game. Not that the attraction of a good play or the comfort of viewing the scenery from the cushioned seat of an automobile are to be decried. The trouble is that they are patronized to the exclusion of the other pastimes and the main reason is because they require less effort. The result is, that where such relaxation is practiced so sedulous-

ly it is bound to have its effect on our work and, in the end, we are not equal to sustained effort through pure physical inability, and this is the starting point of physical disability.

That the employer has grasped the necessity of keeping in form is evidenced by his recreation consisting of golf, tennis, etc., but he has forgotten to impress upon his employees the advantages to be gained from proper use of their play-hours, and so has to pay a medical force to help them through their work-hours.

Our Pig-Iron Production in 1914

(See Table on Opposite Page)

William G. Gray, statistician of the American Iron and Steel Institute, has issued Bulletin No. 1 for 1915, giving the statistics of production of pig iron in the United States in 1914. The total is 23,332,244 gross tons, against 30,966,152 tons in 1913. In these totals, Mr. Gray says, all pig iron and ferroalloys are included, whether made in blast furnaces or in electric furnaces. Pig iron made with bituminous coal is included under coke pig iron. Pig iron made with mixed anthracite and coke is included in anthracite pig iron. Pig iron made with coke and electricity is included in coke pig iron; that made with charcoal and electricity is included in charcoal pig iron. Low phosphorus pig iron, that is, iron running under 0.04 in phosphorus, is included in Bessemer pig iron. Pig iron containing from 0.04 to 0.10 per cent. of phosphorus is classified as Bessemer. The figures for 1913 and 1914 include under basic iron a small quantity of charcoal iron of basic grade. In 1912 and prior years charcoal pig iron of basic quality was not included in the basic production. Nearly all the charcoal iron is classed as foundry pig iron. Ferrosilicon is included in foundry pig iron. Pig iron containing 7 per cent. or over of silicon is classified as ferrosilicon. Under "all other grades" are included white and mottled iron, direct castings, and miscellaneous ferroalloys. Where not separately stated, ferromanganese and spiegeleisen are included in "all other." Special classifications by Mr. Gray are given as follows:

Production by Grades, 1913-1914—Gross Tons					
Grades	1914	Per cent.	1913	Per cent.	
Basic	9,670,687	41.45	12,536,693	40.48	
Bessemer	7,859,127	33.68	11,590,113	37.44	
Foundry	4,533,254	19.42	5,220,343	16.86	
Malleable	671,771	2.88	993,736	3.21	
Forge	361,651	1.55	324,407	1.05	
Spiegeleisen	79,935	0.34	110,338	0.36	
Ferromanganese	106,083	0.46	119,495	0.38	
All other	49,736	0.21	71,027	0.23	
Total	23,332,244	100.00	30,966,152	100.00	

Methods by Which Basic Iron Was Cast or Delivered

States	Sand cast, machine cast, chill cast, etc.	Molten condition	Total Gross tons
New York, New Jersey.....	139,397	249,790	389,187
Pennsylvania	1,705,611	3,561,193	5,266,804
Alabama	145,130	398,022	543,152
Ohio	808,788	699,485	1,508,273
Indiana, Ill., Mich., Mo., Colo..	435,615	1,527,656	1,963,271
Total, gross tons.....	3,234,541	6,436,146	9,670,687

Methods by Which Bessemer and Low-Phosphorus Iron Was Cast or Delivered

States	Sand cast, machine cast, chill cast, etc.	Molten condition	Total Gross tons
New York, Maryland.....	138,220	306,126	444,346
Pennsylvania	1,133,864	2,169,390	3,303,254
West Va., Kentucky, Tenn....	137,585	44,451	182,036
Ohio	794,964	2,110,501	2,905,465
Illinois	186,807	837,219	1,024,026
Total, gross tons.....	2,391,440	5,467,687	7,859,127

Production of Cold and Warm Blast Charcoal Iron

Kinds of iron	1910	1911	1912	1913	1914
Cold blast	10,276	10,930	8,864	10,222	9,294
Hot and warm blast*	386,231	267,746	338,161	329,759	254,630
Total, gross tons.....	396,507	278,676	347,025	339,981	263,924

*Includes iron made with charcoal and electricity.

A new high rate for steamer cargo from Argentina to England was reported by the London Times on February 5 as \$16 per ton.

PRODUCTION OF PIG IRON IN THE UNITED STATES IN 1914.

HALF-YEARLY PRODUCTION OF PIG IRON BY STATES IN 1914.

States.	Blast furnaces.				Production—Gross tons.		
	In blast June 30, 1914.	December 31, 1914.			(Includes spiegeleisen, ferro-mang., ferro-silicon, ferro-phosphorus, etc.)		
		In.	Out.	Total.	First half of 1914.	Second half of 1914.	Total for 1914.
Massachusetts.....	0	1	1	2	4,292	2,302	6,594
Connecticut.....	1	1	2	3			
New York.....	13	12	15	27	818,425	741,439	1,559,864
New Jersey.....	2	1	5	6			
Pennsylvania.....	76	63	96	159	5,207,051	4,526,318	9,733,369
Maryland.....	2	2	3	5	101,605	93,980	195,584
Virginia.....	8	3	19	22	164,796	106,432	271,228
Georgia.....	0	0	4	4			
Texas.....	0	0	3	3			
Alabama.....	20	18	30	48	902,186	924,743	1,826,929
West Virginia.....	1	1	3	4			
Kentucky.....	1	1	5	6	136,742	99,651	236,393
Mississippi.....	0	0	1	1			
Tennessee.....	6	4	14	18	113,137	103,601	216,738
Ohio.....	48	31	43	74	2,865,367	2,416,059	5,281,426
Illinois.....	12	7	19	26	1,045,905	801,546	1,847,451
Indiana.....	8	4	6	10	851,700	705,655	1,557,355
Michigan.....	8	9	5	14			
Wisconsin.....	3	3	5	8	195,991	133,535	329,526
Minnesota.....	1	0	1	1			
Missouri.....	1	1	1	2			
Colorado.....	2	2	4	6			
Oregon.....	0	0	1	1	128,897	138,880	267,777
Washington.....	0	0	1	1			
California.....	0	0	0	0			
Total.....	208	164	287	451	12,536,094	10,796,150	23,332,244

HALF-YEARLY PRODUCTION OF COKE PIG IRON.

New York.....	13	12	11	23	818,425	741,427	1,559,852
New Jersey.....	2	1	4	5			
Pennsylvania.....	69	58	78	136	5,147,691	4,490,988	9,638,679
Maryland.....	2	1	3	4	101,605	93,739	195,344
Virginia.....	7	3	17	20			
Georgia.....	0	0	2	2	163,380	104,429	267,759
Texas.....	0	0	2	2			
Alabama.....	19	16	28	44	893,867	912,904	1,806,771
West Virginia.....	1	1	3	4	136,617	99,634	236,251
Kentucky.....	1	1	4	5			
Tennessee.....	6	4	13	17	113,137	101,527	214,664
Ohio.....	42	30	43	73	2,865,267	2,416,981	5,282,248
Illinois.....	12	7	19	26	1,045,905	801,546	1,847,451
Indiana.....	8	4	6	10			
Michigan.....	1	2	1	3	890,814	728,740	1,619,554
Wisconsin.....	3	2	4	6			
Minnesota.....	1	0	1	1			
Missouri.....	0	0	1	1			
Colorado.....	2	2	4	6	158,162	150,121	308,283
Washington.....	0	0	1	1			
California.....	0	0	0	0			
Total.....	189	144	245	389	12,334,820	10,642,036	22,976,856

HALF-YEARLY PRODUCTION OF CHARCOAL PIG IRON.

Massachusetts.....	0	1	1	2			
Connecticut.....	1	1	2	3	4,292	2,314	6,606
New York.....	0	0	1	1			
New Jersey.....	0	0	1	1			
Pennsylvania.....	2	2	4	6	1,853	1,373	3,226
Maryland.....	0	1	0	1	1,466	2,253	3,719
Virginia.....	1	2	2	4	8,319	11,839	20,158
Alabama.....	0	0	2	2			
Georgia.....	0	0	1	1			
Texas.....	0	0	1	1			
Kentucky.....	0	0	1	1			
Tennessee.....	0	0	1	1	225	3,169	3,394
Mississippi.....	0	0	1	1			
Ohio.....	1	1	0	1			
Michigan.....	7	7	4	11	106,203	88,496	194,699
Wisconsin.....	0	1	1	2			
Missouri.....	1	1	0	1	21,409	10,713	32,122
Oregon.....	0	0	1	1			
California.....	0	0	0	0			
Total.....	14	17	25	42	143,767	120,157	263,924

TOTAL PRODUCTION OF PIG IRON ACCORDING TO FUEL USED.

Coke.....	189	144	245	389	12,334,820	10,642,036	22,976,856
Anthracite.....	5	3	17	20	57,507	33,937	91,464
Charcoal.....	14	17	25	42	143,767	120,157	263,924
Total.....	208	164	287	451	12,536,094	10,796,150	23,332,244

* Includes mixed anthracite and coke pig iron.

FIG IRON MADE FOR SALE OR FOR CONSUMPTION OF MAKERS.

States.	For sale.	For consumption.	Total.
			Gross tons.
Massachusetts, Connecticut.....	5,494	1,100	6,594
New York, New Jersey, Maryland.....	1,112,389	643,169	1,755,558
Pennsylvania.....	1,752,798	7,980,571	9,733,369
Virginia, West Virginia, Alabama.....	1,698,037	628,135	2,326,172
Kentucky, Tennessee, Mississippi.....	299,967	15,129	315,116
Ohio.....	1,295,463	3,916,963	5,212,426
Indiana, Illinois.....	307,830	2,535,940	3,043,770
Mich., Wis., Minn., Mo., Cal., Cal.....	710,082	248,257	958,339
Total.....	7,369,980	15,969,264	23,339,244

PRODUCTION OF PIG IRON BY GRADES IN 1914.

HALF-YEARLY PRODUCTION OF BASIC PIG IRON.

States.	First half of 1914.	Second half of 1914.	Total for 1914.
New York, New Jersey.....	153,112	236,075	389,187
Pennsylvania—Allegheny County.....	1,326,364	1,283,261	2,619,625
Other counties.....	1,346,789	1,300,300	2,647,179
Alabama.....	295,283	247,809	543,152
Ohio.....	798,505	709,768	1,508,273
Indiana, Illinois.....	942,104	737,064	1,679,168
Michigan, Missouri, Colorado.....	148,490	135,613	284,103
Total.....	5,010,647	4,660,040	9,670,687

HALF-YEARLY PRODUCTION OF BESSEMER PIG IRON.

States.	First half of 1914.	Second half of 1914.	Total for 1914.
New York.....	170,854	78,148	249,002
Pennsylvania.....	1,880,451	1,422,803	3,303,254
Maryland.....	101,605	93,739	195,344
West Virginia, Kentucky, Tennessee.....	112,339	69,697	182,036
Ohio.....	1,551,795	1,353,670	2,905,465
Illinois.....	561,054	462,972	1,024,026
Total.....	4,378,098	3,481,029	7,859,127

HALF-YEARLY PRODUCTION OF FOUNDRY PIG IRON.*

States.	First half of 1914.	Second half of 1914.	Total for 1914.
Massachusetts, Connecticut.....	4,292	2,302	6,594
New York, New Jersey.....	405,388	297,504	702,892
Pennsylvania.....	401,449	330,176	731,625
Maryland, Virginia, West Virginia.....	163,477	100,560	264,037
Kentucky, Mississippi.....	30,545	39,768	70,313
Tennessee.....	94,437	82,280	176,717
Alabama.....	577,139	645,979	1,223,109
Ohio.....	394,437	246,037	640,474
Indiana, Illinois.....	72,520	101,967	174,487
Michigan.....	160,248	126,445	286,693
Wisconsin.....	132,126	73,213	205,339
Minnesota, Missouri, Colorado, California.....	48,462	32,492	80,954
Total.....	2,454,540	2,078,714	4,533,254

* Includes a small quantity of silico-spiegel.

HALF-YEARLY PRODUCTION OF MALLEABLE PIG IRON.

States.	First half of 1914.	Second half of 1914.	Total for 1914.
New York.....	80,445	125,034	205,479
Pennsylvania.....	53,055	4,463	57,518
Kentucky, Ohio.....	110,568	65,251	175,819
Illinois, Michigan, Wisconsin.....	139,071	93,884	232,955
Total.....	383,139	288,632	671,771

HALF-YEARLY PRODUCTION OF FORGE PIG IRON.

States.	First half of 1914.	Second half of 1914.	Total for 1914.
New York, New Jersey.....	6,162	4,001	10,163
Pennsylvania.....	128,874	91,940	220,814
Virginia.....	3,192	7,997	11,189
Tennessee.....	1,652	1,534	3,186
Alabama.....	17,111	14,021	31,132
Ohio.....	40,492	44,675	85,167
Total.....	197,483	164,168	361,651

HALF-YEARLY PRODUCTION OF SPIEGELEISEN AND FERRO-MANGANESE.

States.	First half of 1914.	Second half of 1914.	Total for 1914.
Penn., Alabama, Illinois, Colo., Cal.....	86,154	99,864	186,018
Total.....	86,154	99,864	186,018

HALF-YEARLY PRODUCTION OF OTHER GRADES.

States.	First half of 1914.	Second half of 1914.	Total for 1914.
New York, New Jersey.....	2,664	677	3,341
Pennsylvania.....	3,809	3,341	7,150
Virginia.....	127	125	252
Tennessee, Alabama.....	16,070	12,933	29,003
Ohio.....	3,109	2,014	5,123
Indiana, Illinois.....	443	612	1,055
Michigan, Wisconsin.....	11	3,001	3,012
Total.....	26,053	23,703	49,756

PRODUCTION OF PIG IRON BY GRADES, 1900-1914.

Years.	Basic.	Bessemer.	Foundry.	Malleable.	Forge.	All other.	Total.
							Gross tons.
1900.....	1,072,376	7,979,327	3,376,445	173,413	793,092	394,589	13,789,242
1901.....	1,448,850	9,596,793	3,548,718	256,532	639,454	388,067	15,878,354
1902.....	2,038,590	10,393,168	3,851,276	311,458	833,093	393,722	17,831,307
1903.....	2,040,726	9,989,908	4,469,023	473,781	783,016	312,798	18,009,252
1904.....	2,483,104	9,068,659	3,827,229	263,529	550,836	273,676	16,497,033
1905.....	4,105,179	12,407,116	4,758,038	635,236	727,817	358,994	22,992,380
1906.....	5,018,674	13,840,518	4,773,011	699,701	597,420	377,867	25,307,191
1907.....	5,375,219	13,231,620	5,151,209	920,290	683,167	419,856	25,781,361
1908.....	4,010,144	7,216,976	3,637,622	414,957	457,164	199,155	15,836,018
1909.....	8,250,225	10,537,570	5,322,415	658,048	725,624	281,769	25,735,471
1910.....	9,084,608	11,245,642	5,290,447	843,125	564,157	305,590	27,303,567
1911.....	8,520,020	9,409,303	4,468,940	612,533	408,841	229,910	23,649,547
1912.....	11,417,886	11,664,015	5,073,873	825,643	469,183	276,337	29,726,937
1913.....	12,536,093	11,560,113	5,220,343	993,736	824,407	309,960	30,964,152
1914.....	9,670,687	7,859,127	4,533,254	671,771	361,651	245,754	23,332,244

FERROMANGANESE SUPPLIES

An Analysis of Our Imports, Production and Consumption—Effect of the War

The importance of a foreign supply of ferromanganese to the steel industry of the United States cannot be exaggerated. Conditions imposed by the war have added to the significance of this statement. A presentation of the sources of this alloy and its consumption in the United States is here given, based on an analysis of the official Governmental figures.

IMPORTS, PRODUCTION AND CONSUMPTION

Of the total consumption of ferromanganese in the United States about 50 per cent. is imported. Previous to the war 90 per cent. of this came from England and about 10 per cent. from Germany. The German source is absolutely cut off and the British embargo, still in force, has prevented shipment from England since early in November. The following table, based on the official figures of the United States Geological Survey and the American Iron and Steel Institute, gives the imports, production and consumption of ferromanganese in this country in gross tons for five years, 1910 to 1914, inclusive:

Our Ferromanganese Imports, Production and Consumption (gross tons)

Year	Imports	Production	Consumption
1910.....	114,278	71,376	185,654
1911.....	80,263	74,482	154,745
1912.....	99,137	125,378	224,515
1913.....	128,070	119,495	247,565
1914.....	82,217	106,083	188,300
Average per year	100,793	99,363	200,156

A further analysis of this table gives the following as the average of our monthly imports, production, and consumption of the alloy:

Our Monthly Imports, Production and Consumption

Year	Imports	Production	Consumption
1910.....	9,523	5,948	15,470
1911.....	6,688	6,207	12,728
1912.....	8,261	10,448	18,709
1913.....	10,672	9,958	20,630
1914.....	6,851	8,840	15,691
Average per month for 5 years.....	8,399	8,280	16,585

In these tables the consumption is taken as the sum of the imports and production, but this cannot be regarded literally, as stocks at the year end always vary and lap over. Production practically represents the tonnage made by the Carnegie Steel Company, production by others having been spasmodic. Importations from Germany in 1913 were about 10,000 tons.

STEEL PRODUCTION AND MANGANESE CONSUMPTION

Taking the steel output of the United States for the same period of five years and estimating the amount of manganese ore and ferromanganese required to produce this steel, we have the following table:

Our Steel Production and the Estimated Manganese Ore and Ferromanganese (gross tons)

Year	Steel output	Estimated manganese ore necessary	Estimated ferromanganese necessary
1910.....	26,094,919	452,500	181,000
1911.....	23,676,106	410,000	164,000
1912.....	31,251,303	543,000	217,500
1913.....	31,300,874	545,000	218,000
1914.....	24,500,000*	427,500*	171,000*

* Estimated.

Official statistics of our steel production for 1914 are not yet issued; the output above of 24,500,000 tons is based on our estimated pig-iron production for 1914 as given by *The Iron Age*, compared with that for 1913. The computed consumption of ferromanganese does not differ greatly from the actual consumption reported in another table. It is difficult to figure precisely the amount required or used, as the consumption varies for various grades of steel. It is also difficult to figure the amount of manganese ore necessary, as the manganese content ranges from at least 40 to 50 per cent. The

estimates are of value as showing in general our requirements.

OUR IMPORTS OF MANGANESE ORE

The domestic production of manganese ore is negligible, being only 4048 gross tons in 1913, and the ore from which our domestic supply of ferromanganese is made is imported from India, Russia and Brazil. The following table will show our imports of manganese ore for 1913 and 1914, giving the total for each year as well as for the ante-war and war periods:

Our Imports of Manganese Ore (gross tons)

	1913	1914
Total imports.....	345,090	283,294
Average per month.....	28,757	23,608
Imports Aug. 1 to Dec. 31....	117,329	119,904
Average per month, Dec. 31..	23,466	23,980
Imports Jan. 1 to July 31....	227,761	163,390
Average per month, July 31..	32,537	23,341

The average importation for 5 years (1910 to 1914) was 269,649 tons per year.

This table reveals a falling off of about 5000 tons per month in our receipts of the ore in 1914 as compared with 1913. The total decrease for 1914 is 61,796 tons, or about 18 per cent. from 1913.

The principal sources of the importations of 345,090 tons in 1913 were:

From Brazil, 70,200; from Russia, 124,337; from India, 141,587 tons.

Of the total estimated world's production of manganese ore of from 2,000,000 to 2,250,000 gross tons per year, Russia furnishes about 49 per cent., India 33 per cent., and Brazil about 9.5 per cent. There is an embargo on exportations from India, while a restriction on shipments from Russia has existed since Turkey entered the war.

BRITISH RECEIPTS OF MANGANESE ORE

Turning to the principal source of our imports of ferromanganese, official British statistics show that the importations of manganese ore in 1913 and 1914 were as follows in gross tons:

British Importations of Manganese Ore

	1913	1914	Decrease
Total imports....	601,177	479,435	121,742 (20%)
To August 1.....	379,774	278,174	101,600 (26.8%)
August 1 to December 31.....	221,403	201,261	20,142 (9.11%)
January.....	60,683	39,413	21,270 (35.45%)

The figures for 1914 show a decrease in importations of 20 per cent. from 1913; the statistics for the war period a decrease of a little over 9 per cent. The real effect of war conditions is not reflected in these; it is more apparent in the figures for January this year, a decrease of 35.45 per cent. from the same month a year ago. Russian sources being cut off and shipments from India being increasingly more difficult; the future decrease in British supplies of ore is not improbable. Statistics as to the recent and present rate of production of British ferromanganese are not available, but it is unquestionably lessening.

Bearing on India's shipments the following is of interest: In November, 1914, only 33,579 gross tons of ore were exported from India as compared with 99,008 tons in November, 1913, a decline of 60,429 tons, or 64.2 per cent. Shipments to Great Britain declined from 34,531 tons in November, 1913, to 24,230 tons in the same month in 1914, and those to Japan from 3529 tons to only 99 tons last November. No shipments at all were made to Germany, Holland, Belgium, France, Italy and Austria, all of which countries figured in the 1913 shipments.

Brazilian Manganese Ore High

Manganese ore from Brazil, which was obtainable for 24½c. per unit, seaboard, in the spring of 1914, is now quoted at 42½c. per unit, f.o.b. seaboard, this country.

The Delaware, Lackawanna & Western is reported to be inquiring for 5 locomotives.

NAVAL FLOATING CRANES

American and Foreign Bids for a 150-Ton One—The Failure at Panama

WASHINGTON, D. C., March 2, 1915.—The Bureau of Yards and Docks of the United States Navy Department on February 27 opened bids for a 150-ton floating revolving crane for the United States Navy Yard at Norfolk, Va. Special interest attached to the competition for this important item as it was understood that several foreign concerns would be among the bidders. Of the seven competitors three were European concerns, two located in Holland and one in Germany. The Bureau's advertisement called for bids upon the Navy Department's design of crane and also allowed each bidder to submit a proposal based upon any desired alternative design. The bidders and their respective bids are as follows:

A. F. Smulders, of Schiedam, Holland, represented by Werf Gusto, agent, Navy Department's design, \$380,000.

Cleveland Crane & Engineering Company, Wickliffe, Ohio, Navy Department's design, \$442,990; special design "A" \$17,800 additional; special design "B" \$2,000 additional.

Wellman-Seaver-Morgan Company, Cleveland, Ohio, Navy Department's design, \$323,750, with additions for various suggested items not embraced in specifications; special design, \$299,000.

Morgan Engineering Company, Alliance, Ohio, Navy Department's design, no bid; special design, \$381,985.

Shipbuilding and Engineering Company, Haarlem, Holland, represented by Werf Conrad, agent, Navy Department's design, \$400,000.

Neumeyer & Dimond, agents, 82 Beaver Street, New York City, understood to represent an unnamed Germany company, Navy Department's design, \$439,500; special design, \$450,000. (The German company is probably the Deutsche Maschinenfabrik A. G., Duisburg, Germany.—EDITOR.)

Bethlehem Steel Company, South Bethlehem, Pa., Department's design, \$353,000; with certain additions and modifications, \$425,000.

No award will be made in this case until the alternative designs submitted by the bidders have been carefully examined. On the face of the proposals the Wellman-Seaver-Morgan Company is easily the lowest bidder, both on the Department's design and on the contractor's design, and it is altogether probable that the award will be made to this firm.

The specifications call for a structure consisting of a floating pontoon or barge carrying a revolving crane having one main hoist of lifting capacity of not less than 150 gross tons, or two main hoists of lifting capacity of not less than 75 gross tons each, and an auxiliary hoist of lifting and traveling capacity of not less than 25 tons and containing a boiler, engine-driven electric generator, with machinery operated in general by electric motors. The hoists may be movable or fixed and must have variable speeds. All hoists must be capable of transferring all loads within their capacity to or from a ship, barge, wharf, or the deck of the pontoon without manoeuvring the pontoon under load. The crane is intended for lifting, handling and moving guns, turrets, armor plates, boilers, and other heavy material to and from cars, wharves and ships, and must possess in a high degree safety, stability, reliability, durability, and ease in manipulation.

W. L. C.

The foregoing details recall to mind the bids which were opened by the Isthmian Canal Commission on January 13, 1913, for the two very large floating cranes for the Panama Canal. These cranes, the largest in the world, were described in *The Iron Age*, May 15, 1913. Each one has a lifting capacity of 250 gross tons at a radius of 22 ft. as against 150 tons at a radius of 62 ft. 6 in. for this new one. The auxiliary hoist has a lift 150 gross tons at a radius of 62 ft. and 100 tons at a radius of 82 ft. compared with 25 tons at a clear distance of 62 ft. 6 in. for this new one. The vertical speed of the auxiliary hoist of the new one shall be not less than 12 ft. per min., when fully loaded and not less than 60 ft. per min., when loaded with not more than 5 gross tons. The total maximum working hook load when the main and auxiliary hoists are both in use is

not to exceed 150 tons. The entire work covered by the contract shall be completed within 18 calendar months from the date of the contract.

The bids for the large Panama Canal cranes were as follows:

Neumeyer & Dimond, as agents for the Deutsche Maschinenfabrik A. G., of Duisburg, Germany: Two cranes, \$820,350; time 580 days. One crane, \$420,175; time 550 days.

Werf Gusto, Schiedam, near Rotterdam, Holland: Two cranes, \$920,000; no time. One crane, \$460,000; no time.

Cowans, Sheldon Co. (Ltd.), Carlisle, England: Two cranes, £230,000; time 548 days. One crane, £115,250; time 548 days.

Wellman-Seaver-Morgan Co., Cleveland, Ohio: Two cranes, \$1,450,000; time 690 days. One crane, \$745,000; time 690 days.

It is interesting to note that the American firm in this case was the highest bidder, whereas for the new contract now under consideration the same firm is the lowest. The contract for the large Panama cranes was awarded to the lowest bidder, the Deutsche Maschinenfabrik A. G., Duisburg, Germany. Considerable protest was heard over this award, but the time of delivery was an important consideration with the commission.

The two cranes at Panama are named the Ajax and the Hercules. The contract called for their delivery on December 4, 1914. The Ajax, according to the Canal Record of January 27, 1915, "was offered for test on December 1. During the test the back portion of the jib collapsed, wrecking the jib. The Hercules was offered for test on December 10, but the test was refused until the cause of the failure of the Ajax had been determined and any doubtful member suitably reinforced." The Canal Record December 23, 1914 also states, regarding the progress of the Ajax in November:

After the dry docking was completed the cast-iron counterweights were placed upon the spindle carriage, in order to prepare the crane for immediate service in raising the drill barge Terebo, sunken several months ago in Culebra Cut. After completing this work satisfactorily the crane was returned to the contractor on November 24, and during the remainder of the month work consisted of doing various small jobs and making adjustments. At the close of the month the crane had not yet been offered for test.

An investigation by the Commission is now in progress as to the exact cause of the failure of the Ajax, and especially whether previous use of it caused any injury. It is understood that the repairs will be completed so that a new test can be made this month.

Berlin to Quote Metal Prices

The elders of the merchants of the city of Berlin have taken preliminary steps to quote hereafter, when normal times will have arrived, independent prices on zinc, lead, aluminum and antimony, according to the weekly report, January 30, of the American Association of Commerce and Trade in Berlin, printed in Commerce Reports. This measure involves the further extension of the activities of the Berlin Metal Exchange, and its prime object is to create independence of the German metal trade from the quotations in London. It seems as if this proceeding is justified in view of actual conditions in the relative production and consumption of metals in the various European countries. It can be considered an anomaly in the metal trades that the price of zinc, for instance, of which Germany is one of the foremost producers and consumers, is fixed in London.

Car and Locomotive Orders This Year

Car orders for February were about 4250, which is the best total for any month since July, 1914. The total for the seven months of the war is put at 14,000 cars, or about one-fifth of normal. Total orders for January and February of this year are 7550 or between one-third and one-half of normal. The total for 1913 was 147,000 cars and for 1914, 80,000 cars.

Export orders for locomotives are 124 to March 1 this year. In 1912, 1913 and 1914, steam locomotive exports were respectively 503, 491 and 269. Domestic orders for locomotives were 190 to March 1, or at the rate of 11.40 per year, which is low.

ESTABLISHED 1855

THE IRON AGE

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Future of British Iron Trade

Although some time has elapsed since the annual meeting of the West of Scotland Iron and Steel Institute, Glasgow, it is by no means too late to refer to remarks made by the new president, Herbert Beard, in the course of an address given on assuming the chair. The European war had then been in progress for some months. Recognizing that much interest was being taken in the question of how Great Britain should meet the new trade conditions brought about by the war, he discussed this subject at considerable length.

Taking the comparative figures for 1900 and 1913, Mr. Beard showed how heavily the United States and Germany had increased their production and exports of iron and steel, while Great Britain had made but a moderate gain. Germany's exports increased 675 per cent. in this period; those of the United States, 139 per cent.; those of Great Britain, 39 per cent. Regarding Germany's growth in foreign trade, he said: "The magnitude of the increase of the German exports weighs down the importance of the increase in the other cases. It has been suggested that the increase in the case of Germany was obtained at a fever heat and with a complete disregard of economic conditions. In my own experience I know the Germans have sold cheaply." Taking the figures of production and noting how the United States and Germany have far surpassed Great Britain, he asks the question, "What do we see?" and proceeds to answer it as follows:

So far as iron and steel are concerned we are only fit to provide a fractional part of the world's requirements. After the war (it is the case now) our equipment may be understaffed. It will be the same on the continent. It requires no great effort of imagination to realize that if last year (1913) we imported rather more than 50 per cent. of the tonnage we exported in iron and steel, a great deal will require to be done to bring our capacity of production to a standard that will enable us not only to provide full supplies for our home consumers under normal conditions in the absence of continental supplies, but to maintain our export trade. That the present time affords an opportunity to all firms with capital resources to improve and increase their plant, in view of possible requirements, goes without saying.

Mr. Beard discusses most interestingly the competition between home and foreign makers for the trade of shipbuilders and other large British consumers of plates and sheets, foreign sellers not being handicapped by any duty in reaching British

markets. He shows that while imports of plates $\frac{1}{8}$ -inch and thicker rose from 57,781 tons in 1910 to 134,612 tons in 1913, and of sheets under $\frac{1}{8}$ -inch from 29,070 tons to 34,865 tons, the exports of similar plates expanded in the same period from 121,378 tons to 132,989 tons, while sheets receded from 73,631 tons to 68,111 tons. Mr. Beard does not complain of the foreign competition, but simply remarks that "the orders were sent to other countries because, being cheaper, they were preferred by those who could not afford the higher price."

As to the future, Mr. Beard almost ignores Germany in his presentation of conditions confronting British manufacturers and what they must do to bring about the following: 1. The manufacture at home of all supplies of iron and steel previously obtained abroad. 2. The manufacture of a larger share of the supplies of iron and steel previously obtained by British colonies and dependencies from the continent of Europe. 3. The capture of a bigger share of the trade in iron and steel in Latin-America and Asia. Elaborating the first proposition, he shows that on the basis of importations in 1913 Great Britain needs to supply its own home markets annually with about two and a quarter million tons. As to the second proposition, he points out that Belgium, the restoration of whose iron and steel industries will take a long time, up to the war had enjoyed a large trade with British colonies and dependencies, while what was supplied by Germany must also be considered. Relative to the third proposition, he says: "It is most likely that the United States of America, because of its geographical position, will obtain the bulk of the trade in iron and steel." And he gracefully adds: "We can be content it should do so if we retain our home markets and obtain the largest share of the trade of our own colonies and dependencies."

The Ferromanganese Situation

The question of securing adequate supplies of ferromanganese grows more serious. The steel industry of the United States imports about 50 per cent. of the alloy that it consumes each year. No importations of any consequence have been received since the British embargo was imposed early in November. Negotiations to lift this embargo have now extended over a period of three months and still no official decision has been reached. While some consumers are well supplied with stocks many others are very low. The alloy is vitally necessary

to the steel industry, and anxiety as to future supplies is becoming more extended each week.

It is understood now that British producers, with the consent of the British government, have proposed to allow 5000 tons per month to be sent to this country, but that differences as to the apportionment of this amount among the various producers have caused friction and the plan is temporarily held up. But none of this alloy nor steel made from it is to go to Britain's enemies. In the meantime stocks here are being rapidly consumed and domestic production is probably not up to normal.

On another page *The Iron Age* presents an analysis of the imports, production and consumption of ferromanganese in this country for a period of years as well as the importations of manganese ore into the United States and Great Britain as affected by the war. A study of those figures will show the actual relation of the alloy to the industry, the extent to which a monthly importation of 5000 tons would relieve the situation and the general importance of the whole subject.

Our yearly imports of ferromanganese from 1910 to 1914 inclusive have averaged 100,793 gross tons; our yearly output, 99,363 tons, making a total average yearly consumption of 200,156 tons. Our monthly importations for the same 5-year period have averaged 8399 gross tons; our monthly output, 8280 tons and our monthly consumption 16,585 tons. In the period under consideration our lowest importations have been 6688 tons per month in 1911 and our highest 10,672 tons per month in 1913. The corresponding lowest total monthly consumption has been 12,728 gross tons in 1911 and the highest 20,630 tons per month in 1913. It is evident, therefore, that, other conditions of production, ore supply and shipping facilities being normal, 5000 tons per month will not satisfy even our present demands. Should there be a sudden revival of the industry, the situation would be still more critical.

Turning to the ore supply from which about 50 per cent. of our total consumption of the alloy is made, the figures referred to show a decrease in our imports of about 18 per cent. in 1914 from 1913. In 1913, of the total importations, about 42.1 per cent. came from India, about 37 per cent. from Russia and about 20.9 from Brazil. War conditions have practically shut off the Russian and Indian supplies. Therefore to secure ore enough to largely increase our own production of ferromanganese, greatly augmented importations from Brazil will be necessary. The probability of this can be deduced when it is realized that, of the total world production of the ore, Brazil furnishes only about 9.5 per cent. Our domestic supply is of little consequence.

The British supply of ore is constantly decreasing, our figures showing a decrease of imports for 1914 of 20 per cent. from 1913 and of 35.45 per cent. for the month of January, 1915, as compared with January, 1914. Unquestionably the British rate of production must be decreasing from this and other cogent causes.

Summarizing the facts: Our present importations are practically nothing and the proposed 5000 tons per month is not enough for present demands;

our importations of manganese ore must be or become decidedly below normal and our domestic supply is negligible, rendering increased production problematical. British ore supplies and production of alloy are probably decreasing, imperiling to some extent our source of imports. Added to this, consideration must be given to the increasingly menacing conditions to possible shipments from England arising from present naval warfare in British waters, even if 5000 or more tons per month could be released. Prices for the little spot material available are soaring, and the nominal quotation for the British product when obtainable has been withdrawn. Attempts thus far made to produce ferromanganese in this country, either in the blast or in the electric furnace, have made but slow progress. Admittedly the situation is tense.

Notes on the Pig-Iron Statistics

The official statistics of pig-iron production in the United States in 1914 do not furnish important fresh information as to the total production, since that has been known to the trade through *The Iron Age's* monthly returns, our total diverging from the official by only 18,568 tons or only eight hundredths of one per cent. The total production by mineral fuel was 23,068,320 gross tons, making, with 263,924 tons of charcoal iron, a grand total of 23,332,244 tons of pig iron.

The details furnished in connection with the official statistics have become more interesting year by year since additional classifications were introduced. A year ago the total was segregated according as the iron was made for the producer's own use or for sale. For 1914 a further refinement is introduced, the segregation being made for each grade. We learned that of the 1913 production 31.4 per cent. was merchant iron and 68.6 per cent. was made for the use of the producers. In 1914 the proportions were practically the same, 31.6 per cent. and 68.4 per cent. The close correspondence of the proportions in two such different years is noteworthy. The general trade view has been that the large steel works are self supporting as to pig iron in ordinary times, but buy considerable tonnages of merchant iron when they are operating their steel works at approximate capacity. As 1913, being a record year for production, must have been a year in which the steel works ran at nearly their capacity, while 1914, showing a drop of 25 per cent. in pig-iron production, was therefore a year of light production, one might have expected the proportion of merchant iron to decrease. Whatever pig iron the producers purchased in 1913 must have been made up by proportionately better operation of the detached steel works in 1914, or by a less decrease in the consumption of foundry pig iron than of steel making iron. The latter influence indeed was exerted to a limited extent, foundry iron production decreasing 13.16 per cent. against a general decrease of 25 per cent.

Merchant pig-iron production is practically confined to foundry, forge and malleable grades, which are customarily sold rather than consumed by producers; to basic pig iron for the use of the smaller and detached steel works, and to Bessemer iron

used in ingot mold foundries. The allotment in 1914 was as follows:

	Total, gross tons	Sold, gross tons	Sold, per cent.
Basic	9,670,687	1,479,721	15.3
Bessemer	7,859,127	527,905	6.7
Foundry	4,533,254	4,393,089	97.1
Malleable	671,771	671,771	100.0
Forge	361,651	196,058	54.2
Spiegeleisen	79,935		
Ferromanganese	106,083	94,436	40.1
All other	49,736		
Total	23,332,244	7,362,980	31.6

The amount of Bessemer iron known to be sold for ingot molds absorbs the major portion of the 527,905 tons of this grade reported as having been made for sale, and as considerable purchases are made by acid open-hearth steel casting plants, with small amounts purchased by gray iron foundries for strong castings, it is evident that the total sold can be accounted for without assuming that any pig iron was bought by the regular Bessemer steel works.

The proportion of basic iron sold indicates quite a thriving industry among detached basic open-hearth steel works. Such works always use large amounts of scrap and thus probably had an output of not far from 3,000,000 gross tons of ingots in 1914, a good tonnage for an off year.

We learn that of the 9,670,687 tons of basic pig iron made last year 6,436,146 tons was delivered in molten condition. Assuming that all the merchant iron was delivered cold, which is no doubt substantially correct, there was 79 per cent. of the basic iron production of consumers that was delivered molten, only 21 per cent. of their output being cast. This points to a very general use of the direct metal process at basic open-hearth steel plants that produce their pig iron, since a certain proportion must always be cast on Sundays, and when it is necessary to stock.

A similar computation cannot be made with Bessemer iron, since much of the merchant iron sold for ingot mold purposes is delivered in the molten state. The proportion of the total Bessemer output that was delivered molten was 69.5 per cent., indicating a fairly general use of the direct metal process, but a distinctly less complete use than in the case of the basic process.

Stimulating Foremen

No factor in works management is more important than that of the foremen. Upon them depends the efficiency of the individual smaller units. They are closest to the workmen. Unless they get the best out of their subordinates the machinery of organization falls down proportionately in its results. The failure of one department may extend its influence through a factory like the oft mentioned row of bricks. Watching the foremen is the most important duty of the shop superintendent. They are his lieutenants. They vary in ability, energy, initiative. Under the bonus system the workmen of one department earn more than those of another, because of the difference in foremen, and the same is true where the latter are included in earnings of the system. Individuality, in its various phases, is the controlling element.

In this connection the influence of unexpected reward is interesting. It has no connection with the humdrum of system. The man who is told in

dollars and cents that he has made good, when he has worked with no thought of such a result of his labor, is impelled mentally and physically to do even better. The man who knows he has failed, because his associates have been rewarded and he has not, will probably make an effort to do better or, if not, will thus show that he does not measure up to the proper standard for his position.

In a certain large machine shop where the ordinary day wage prevails, with no extra money to anyone, several times a year the manager makes a money present to a few of the foremen who have achieved the best results. No one but the manager knows the amount of the present, not even the office. The affair is between him and the individual employee. It is, however, not easy to believe that word of these earned gifts does not spread through the shops. The foreman who has failed, according to the standard of the manager, can find the reason. It may be favoritism in the hiring of men and the giving out of work. It may be that he has a tendency to stick in a rut or he may not have been efficient for other reasons, such as not seeing that his men were getting the best results from their machines and tools.

The Disease of Metals

The article in *The Iron Age* of February 18, 1915, "The Liberty Bell and the Disease of Metals," has been the cause of a number of letters and inquiries to Alexander E. Outerbridge, Jr., of Philadelphia, who furnished the data on which the article was based. He writes as follows:

"After receiving various inquiries I hunted up the original address of Professor Cohan at the library of the Franklin Institute, Philadelphia, and found that it was given before the Faraday Society, not the Royal Society, as I incorrectly stated. The paper is printed in full with striking half-tone cuts and several diagrams in the 'Transactions of the Faraday Society,' November, 1911. A number of prominent scientists contributed to the discussion, including Prof. T. Turner, who referred to his investigations of 'decay' of lead plates and called it 'strain disease.' There is a typographical error in the spelling of the name of Doctor Rosenhain, not Rosenheim, as my communication to the Public Ledger had it—probably my own mistake.

"I was told recently that in Russia tin plate is tabooed for roofing, gutter pipes, organ pipes, etc., for even when painted the tin part will not stand cold. Furthermore, that the same species of disintegration has been observed in aluminum water bottles, military buttons and other equipment in Russia, where great cold is experienced at times.

"I have in my collection of coins a genuine counterfeit Roman coin, a lead casting, which has spots of gray material, exactly like the illustration, in Professor Cohan's paper, of a tin medal afflicted with the 'tin pest.' I had supposed this was merely corrosion from having been buried for centuries."

The Hartford Auto Parts Company, Hartford, Conn., manufacturer of universal joints and cone clutches, has been reorganized with the following board of officers: President, C. C. Chamberlain, of the Blakeslee Forging Company, Plantsville, Conn.; vice-president, James M. Carney, treasurer of the Davidson & Watts Mfg. Company, Hartford; treasurer, Edward D. Redfield; secretary and assistant treasurer, Harry W. Bigelow. The directors are Messrs. Chamberlain, Carney and Redfield, John H. Trumbull, president Trumbull Electric Company, Plainville, Conn., and Horace H. Ensworth, L. L. Ensworth & Son, Hartford. The company's factory is running overtime, with orders ahead to insure a busy year.

AGAINST TIME STUDIES

Scientific Management Prohibited in Navy Yards
—Army Work Yet in Doubt

WASHINGTON, D. C., March 2, 1915.—At a late hour to-night Congress voted to prohibit the use of the so-called Taylor system of scientific shop management in the navy yards of the country. The question as to whether the arsenals under the War Department also shall be forbidden by law to employ this system will be determined in the last hours of the present session, which expires at noon on March 4. The amendments to both the army and navy appropriation bills forbidding the use of the Taylor time-study and premium system incorporated in the House were stricken out by the Senate and the fate of the provision was thus left to the conference committees. The conferees on the army bill found this amendment to be the chief bone of contention and being unable to agree upon it they decided to report upon all the remaining features of the Army budget, leaving the scientific shop management provision to be fought out under the high pressure of the last moments of the session. The conferees having the Navy bill in charge also found the scientific shop management feature a stumbling block and decided not to act upon it until the corresponding provision of the Army bill should be finally disposed of. Fearing that delay might imperil the naval bill, however, the Senate late to-night yielded the point to the House and the prohibition inserted by that body goes into the law. The provision in the Army bill is still in doubt.

For the purpose of giving employees of the Watertown arsenal as full participation in dealing with matters with which they are closely concerned as is consistent with the interest of the Government and the responsibility which devolves upon the War Department, General Crozier, chief of the ordnance bureau, has promulgated a series of instructions in regard to the hearing of grievances which outlines the machinery for collective bargaining between the Government and its employees at the establishment referred to and which, if successful, may be extended to other arsenals and Government establishments. The plan covered by these instructions is the result of a series of conferences between General Crozier, Colonel Wheeler, commanding officer of the Watertown arsenal; William O. Thompson, counsel for the United States Commission on Industrial Relations; N. P. Alifas, of the International Association of Machinists, and John R. O'Leary, of the Molders' Union.

This order provides a shop board, consisting of a representative of the arsenal and of the employees in the shop where the grievance arises. In case the shop board fails to adjust the grievance it shall then be taken up by the arsenal board, consisting of an officer of the arsenal, to be selected by the commanding officer, and a representative of the employees of the whole arsenal, to be selected by the employees. In case the members of the arsenal board cannot agree they shall submit a statement of the subject in controversy to the mediation board, consisting of five members appointed as follows:

The commanding officer shall appoint from his staff an officer who, if practicable, shall act continuously; the commanding officer shall also appoint an additional member, who may be an officer or an employee, not from the rank and file of the employees and who must not be a party to the grievance. The employees on their part may also appoint two representatives from among themselves, the first to act as continuously as practicable; the second shall, if possible, be a representative of the craft which has the complaint before the board, but he must not be personally involved in the question for adjudication. The commanding officer and employees shall select a fifth man, who shall act as chairman of the board. Appeal may be taken from the decision of the mediation board to a supreme mediation board, which shall consist of three members, one to be appointed by the chief of ordnance, one to be appointed by the crafts representing all the employees of the arsenal, and these two to choose a third member who

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shall act as chairman. The findings of the supreme mediation board are not to be final, but are to be subject to the approval of the chief of ordnance, with an appeal from him to the Secretary of War.

Since the promulgation of this order Mr. Alifas has announced that the plan has been rejected by the employees of the Watertown arsenal as "unsatisfactory," but further details of the disagreement are not yet available.

W. L. C.

German Embargo on Spelter

A German embargo on spelter is announced. Exportations can only be made to friendly countries and with special governmental permission. Normally Germany ranks second to the United States in the production of spelter, its output in 1913 being 283,113 metric tons and its consumption 232,000 metric tons, compared with 320,283 metric tons produced in the United States in the same year and 313,300 tons consumed. German production proceeds now but at a low rate.

Mechanical Engineers' Boiler Code

The American Society of Mechanical Engineers has printed in pamphlet form the report of the boiler code committee which was accepted by the council on February 13. This is issued as a preprint of the Transactions of the Society and can be secured by interested parties for the sum of \$1.50, the price to members being 50 cents less.

A GAIN OF 16 FURNACES

Production Increase Is 8200 Tons a Day

Steel Works Furnaces Show Increase—Merchant Iron Output Stationary

February pig-iron production was 73,350 tons greater than that of January, though the month was three days shorter. As in January this increase was due altogether to the blowing in of steel works furnaces. The total for the month of February was 1,674,771 tons, or 59,813 tons per day, compared with 1,601,421 tons in January, or 51,659 tons per day. The increase in the production of steel works furnaces was 8194 tons per day, while the merchant furnace production declined 40 tons per day from the January figure. The active capacity increased from 56,270 tons on February 1 to 63,033 tons on March 1. The number of stacks in blast on March 1 was 176 as compared with 160 on February 1 and 146 on January 1, representing a net gain of 30 furnaces since the first of the year. While the total production of steel-making iron increased approximately 122,000 tons in the month, the production of ferromanganese, spiegeleisen and ferro-silicon declined 4722 tons.

DAILY RATE OF PRODUCTION

The daily rate of production of coke and anthracite pig iron by months, from February, 1914, is as follows:

Daily Rate of Pig-Iron Production by Months—Gross Tons			
	Steel works	Merchant	Total
February, 1914.....	47,479	19,974	67,453
March	54,990	20,748	75,738
April	54,508	21,157	75,665
May	47,028	20,478	67,506
June	44,321	19,595	63,916
July	45,027	18,123	63,150
August	46,937	17,426	64,363
September	46,344	16,409	62,753
October	41,026	16,335	57,361
November	35,305	15,306	50,611
December	33,381	15,515	48,896
January, 1915	35,998	15,661	51,659
February	44,192	15,621	59,813

OUTPUT BY DISTRICTS

The accompanying table gives the production of all coke and anthracite furnaces in February and the three months preceding:

Monthly Pig-Iron Production—Gross Tons				
	Nov. (30 days)	Dec. (31 days)	Jan. (31 days)	Feb. (28 days)
New York	113,675	126,271	121,292	113,509
New Jersey	6,910	6,973	6,564	6,096
Lehigh Valley	59,527	65,388	62,205	62,384
Schuylkill Valley	49,772	44,786	40,691	39,756
Lower Susquehanna and Lebanon Valley	33,674	30,836	32,535	31,961
Pittsburgh district	352,508	349,401	370,745	429,771
Shenango Valley	56,076	54,289	66,184	80,922
Western Pennsylvania, Maryland, Virginia and Kentucky	120,959	116,295	122,713	116,524
Wheeling district	35,222	34,201	33,481	27,828
Mahoning Valley	51,593	52,194	54,563	60,692
Central and Northern Ohio	148,640	148,057	171,624	182,912
Hocking Valley and Hanging Rock	130,850	117,473	119,349	134,640
Chicago district	18,460	20,785	24,317	25,822
Mich., Minn., Mo., Wis. and Col.	143,288	139,289	155,038	174,346
Alabama	41,355	49,944	60,218	60,787
Tennessee	138,412	141,948	144,985	126,289
	17,395	17,622	14,917	10,592
Total	1,518,316	1,515,752	1,601,421	1,674,771

PRODUCTION OF STEEL COMPANIES

Returns from all furnaces of the United States Steel Corporation and the various independent steel companies show the following totals of product month by month. Only steel-making iron is included in the figures below, together with ferromanganese, spiegeleisen and ferrosilicon. These last, while stated separately, are also included in the columns of "total production."

Production of Steel Companies—Gross Tons				
	Pig, total production—			Spiegeleisen, ferromanganese, etc.
	1913	1914	1915	1913 1914 1915
Jan.	1,981,560	1,261,430	1,115,944	15,633 17,325 18,041
Feb.	1,792,154	1,329,414	1,237,380	20,131 10,524 13,319
Mar.	1,904,878	1,704,688	.....	20,546 20,133
Apr.	1,939,751	1,635,226	.....	23,108 18,676
May	1,991,192	1,457,847	.....	19,042 21,504
June	1,860,070	1,329,623	.....	19,212 16,254
July	1,840,216	1,395,851	.....	22,310 16,524
Aug.	1,833,352	1,455,054	.....	20,680 11,577
Sept.	1,828,232	1,390,322	.....	24,555 13,786
Oct.	1,848,634	1,271,820	.....	19,499 17,435
Nov.	1,573,007	1,059,159	.....	26,765 21,977
Dec.	1,298,262	1,034,802	.....	14,095 20,733

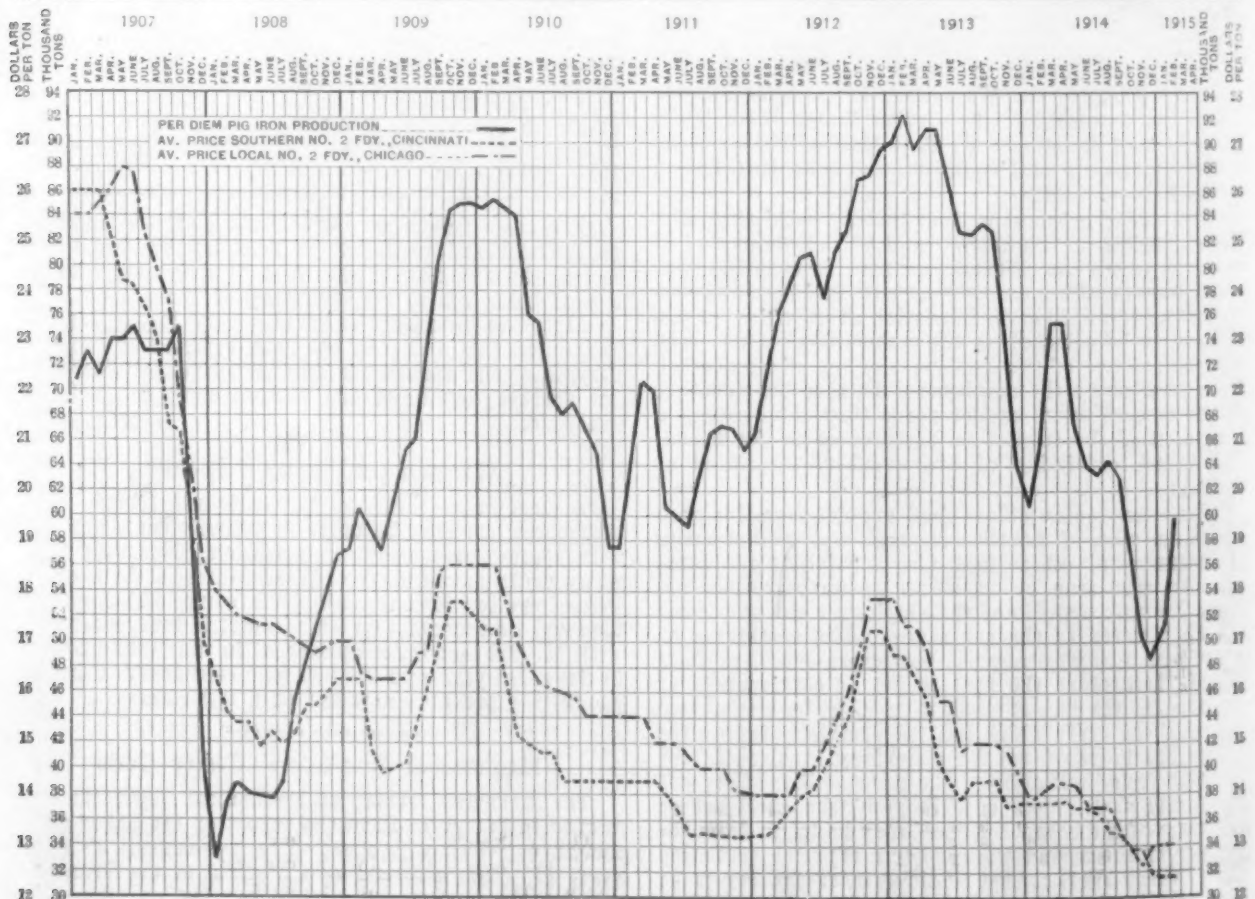


Diagram of Daily Average Production by Months of Coke and Anthracite Pig Iron in the United States from January 1, 1907, to March 1, 1915; Also of Monthly Average Prices of Southern No. 2 Foundry Iron at Cincinnati and Local No. 2 Foundry Iron at Chicago District Furnace

CAPACITY IN BLAST MARCH 1 AND FEBRUARY 1

The following table shows the daily capacity in gross tons of furnaces in blast March 1 and February 1, by districts:

Coke and Anthracite Furnaces in Blast					
Location of furnaces	Total number of stacks	Mar. 1		Feb. 1	
		Number in blast	Capacity per day	Number in blast	Capacity per day
<i>New York:</i>					
Buffalo	19	11	3,708	10	3,461
Other New York	7	2	431	2	452
New Jersey	7	1	218	1	212
<i>Pennsylvania:</i>					
Lehigh Valley	22	7	1,687	7	1,825
Spiegel	2	2	184	2	179
Schuylkill Val.	16	4	1,420	4	1,313
Lower Susque- hanna	7	2	520	2	520
Lebanon Valley	10	3	619	3	529
Pittsburgh Dist.	52	36	16,714	28	13,420
Ferro	4	1	120	2	230
Shenango Val.	19	7	2,890	7	2,610
Western Pa.	26	12	4,078	12	4,098
Ferro	1	1	85	1	30
Maryland	3	1	297	1	430
Ferro	1	1	113	0	0
Wheeling District ..	11	6	2,168	6	2,228
<i>Ohio:</i>					
Mahoning Val.	25	16	7,125	14	6,143
Central and Northern	24	12	4,809	10	4,239
Hocking Val. & Hanging Rock	15	6	922	5	850
Illinois and Ind.	34	14	7,082	12	5,532
Ferro	2	1	75	1	101
Michigan, Wis. & Minn.	10	5	1,404	5	1,348
Colo. and Mo.	7	2	767	2	717
Ferro	1	0	0	0	0
<i>The South:</i>					
Virginia	24	4	550	3	423
Kentucky	5	1	241	1	217
Alabama	45	14	4,321	15	4,621
Ferro	1	0	0	1	55
Tennessee	20	4	485	4	481
Total	423	176	63,033	160	56,270

Among the furnaces blown in last month were Buffalo Union B in the Buffalo district; two Shoenberger, one Carrie, one Clairton, one Duquesne, two Edgar Thomson and one Eliza in the Pittsburgh district; Oriskany in Virginia, one stack of the Maryland Steel Company; one Ohio, one Hannah and one Youngstown Sheet & Tube in the Mahoning Valley; one Central and one National Tube in northern Ohio, Bessie in the Hocking Valley, two South Chicago and one Gary in the Chicago district and Johnson City in Tennessee.

The furnaces blown out in February include Anna in the Mahoning Valley, one South Chicago in the Chicago district, one Bessemer and Tuscaloosa in Alabama and La Follette in Tennessee, which was banked.

DIAGRAM OF PIG-IRON PRODUCTION AND PRICES

The fluctuations in pig-iron production from January, 1907, to the present time are shown in the accompanying chart. The figures represented by the heavy lines are those of daily average production, by months, of coke and anthracite iron. The two other curves on the chart represent monthly average prices of Southern No. 2 foundry pig iron at Cincinnati and of local No. 2 foundry iron at furnace at Chicago. They are based on the weekly market quotations of *The Iron Age*. The figures for daily average production, beginning January, 1908, are as follows:

Daily Average Production of Coke and Anthracite Pig Iron in the United States by Months Since January 1, 1908—Gross Tons

	1908	1909	1910	1911	1912	1913	1914	1915
Jan.	33,918	57,975	84,148	56,752	66,384	90,172	60,808	51,659
Feb.	37,163	60,976	85,616	64,090	72,442	92,369	67,453	59,813
Mar.	39,619	59,232	84,459	70,036	77,591	89,147	75,738	.....
Apr.	38,289	57,962	82,792	68,836	79,181	91,759	75,665	.....
May	37,603	60,753	77,102	61,079	81,051	91,039	67,506	.....
June	36,444	64,656	75,516	59,585	81,358	87,619	63,916	.....
July	39,287	67,793	69,305	57,841	77,738	82,601	63,150	.....
Aug.	42,851	72,546	67,963	62,150	81,046	82,057	64,363	.....
Sept.	47,300	79,507	68,476	65,903	82,128	83,531	62,753	.....
Oct.	50,554	83,856	67,520	67,811	86,722	82,133	57,361	.....
Nov.	51,595	84,917	63,659	66,648	87,697	74,453	50,611	.....
Dec.	56,158	85,022	57,349	65,912	89,766	63,987	48,896	.....

THE RECORD OF PRODUCTION

Production of Coke and Anthracite Pig Iron in the United States by Months Since January 1, 1911—Gross Tons

	1911	1912	1913	1914	1915
Jan.	1,759,326	2,057,911	2,795,331	1,885,054	1,601,421
Feb.	1,794,509	2,100,815	2,586,337	1,888,887	1,674,771
Mar.	2,171,111	2,405,318	2,763,563	2,347,867	.....
Apr.	2,064,086	2,375,436	2,752,761	2,269,955	.....
May	1,893,456	2,512,582	2,822,217	2,092,684	.....
June	1,787,566	2,440,745	2,628,565	1,917,783	.....
July	1,793,068	2,410,889	2,560,646	1,957,645	.....
Aug.	1,926,637	2,512,431	2,546,763	1,995,261	.....
Sept.	1,997,102	2,463,839	2,505,927	1,882,577	.....
Oct.	2,102,147	2,689,933	2,546,261	1,778,186	.....
Nov.	1,999,433	2,630,854	2,233,123	1,518,316	.....
Dec.	2,043,270	2,782,737	1,983,609	1,310,404	.....

Report of American Steel Foundries

The unsatisfactory condition of the steel foundry trade is indicated by the report of operations for the year ended December 31, 1914, just issued by the American Steel Foundries. This report shows a net loss on the operations of the year of \$231,481.79. The earnings of the year, after deducting manufacturing, selling, administrative and office expenses, were \$637,503.19. For depreciation there was written off \$231,455.86. In addition to the regular interest charges the amount of \$222,943.14 was set aside for bond redemption and \$249,532.52 for debenture retirement. The total profit and loss account at the close of the year was \$667,987.31. President R. P. Lamont, in his accompanying remarks, says in part:

"Perhaps the most comforting statement that can be made concerning the operations of the company for the year is that after spending \$913,084.70 for repairs and maintenance, charging \$231,455.86 to depreciation, and paying out \$343,680 in dividends, we ended up the year with net assets practically the same as they were at the beginning, the actual decrease being less than \$8000.

"The operations for the year were at the rate of 50.4 per cent. of the rated capacity of the plants, as against 80.1 per cent. for the previous year. Our gross sales were \$11,125,091.39, against \$17,425,940.91 for 1913.

"It is difficult to say much as to the present year; one guess is as good as another. We are showing small gains in tonnage at some of the plants, and there is more business in prospect now than there has been at any time since the outbreak of the war, but actual orders materialize very slowly. If the crop situation develops favorably we may be operating on a satisfactory basis during the second six months of the year."

J. K. Larkin & Co., iron and steel merchants, 34 Reade street, New York, have bought the merchandise, stock and general business of Miller & Brewer, 279 Pearl street, New York, an old-established firm that has done quite a large trade in cut and wire nails, chain, spikes, etc. They will continue the business of the old house at its old address. Larkin & Co. also announce that they will carry in stock the wire nails of the Jones & Laughlin Steel Company, Pittsburgh, and will act as the company's distributors of wire nails in the New York market. They have warehouses at 34 Reade street, New York, and Bush Docks, Thirty-sixth street, Brooklyn.

A patent (U. S. 1,122,861—December 29, 1914) has been granted to James Churchward, Mt. Vernon, N. Y., the object of which is to provide an alloy which shall be highly capable of withstanding shock, impact and vibration. The composition mentioned in the patent papers is: Nickel, 3.50; chromium, 2; tungsten, 1; vanadium, 0.35; manganese 0.50; and silicon, 0.25 per cent., with "steel" approximately 92.40 per cent. The steel preferably contains 0.10 to 1 per cent. of carbon. The patent is assigned to the Churchward International Steel Company, New York.

The Roberts Motor Mfg. Company, Sandusky, Ohio, has been incorporated with a capital stock of \$50,000 to take over and operate the plant of the Roberts Motor Company of that city. It is announced that the company has been organized by William McLaren of Chicago. The affairs of the old company are involved in court proceedings. W. H. Burke and E. R. Johnson, general manager and superintendent respectively of the old company, are to remain in their present capacity. The plant makes marine and aero-plane engines.

The value of British commerce for January was \$499,030,680, representing a continual recovery each month since the outbreak of the war except in November. It exceeds November by \$79,884,335 and December by \$13,819,052. The January total, however, is \$111,267,920 less than that of January, 1914, and \$120,931,835 less than that for the same month in 1913.

The Iron and Metal Markets

WESTERN RAIL ORDERS

Canadian Mill Sells to Illinois Central

February Pig-Iron Production Reflects Larger Operations of Steel Works

The February record of larger specifications by buyers and of broadening operations of mills has created a good feeling in the steel trade, but with it a question is raised as to the maintenance in March of the recent rate of new bookings. The advance of heavy steel products to 1.15c. Pittsburgh, put into effect March 1, finds many consumers covered for this month at 1.10c., while not a few have contracts at 1.10c. that will carry them one or two months into the second quarter. It is not likely, therefore, that bars, plates and structural steel will be active enough at once really to try out the new prices.

The month starts with steel ingot production at 60 to 65 per cent. of capacity, the latter being the Steel Corporation's rate. Due to the heavier shipments last month—and shipments are the real barometer—the Steel Corporation's unfilled orders at the end of February, while more than at the end of January, showed a smaller increase for the second month than for the first.

A number of independent producers have had the same experience as the Steel Corporation—larger shipments in February than in January, but with a tendency to quietness showing itself as the month ended.

While disappointing as to cars and locomotives, there is no great complaint of railroad buying of rails, which for the first two months of the year has exceeded 500,000 tons. The Algoma Steel Company's sales to railroads in the United States have excited more comment in view of a contract for 5000 tons closed last week with the Illinois Central. Rumor made this sale considerably larger, but verification of a higher tonnage is lacking. Previous sales of the Sault mill on this side were over 20,000 tons, including two of 500 tons each of open-hearth rails in northern Ohio, one of these being at \$29.40 delivered, or nearly \$3 under the quotation of domestic mills. The Nova Scotia mill is a competitor for 8,000 tons of rails for a New England electric line.

The Northern Pacific has bought 20,000 tons of rails, of which 8500 tons were placed at Chicago, 7500 tons at Buffalo and 4000 tons at Pueblo. The Illinois Central will buy its Southern rails, amount not stated, from the Ensley mill. The Great Northern has given out 10,000 tons in the week and the Omaha road 5400 tons. The International Great Northern has placed 1500 tons at Ensley and the Pennsylvania has given the Illinois Steel Company a similar trial order (2000 tons) to those placed with Eastern mills.

British mills will furnish the 25,000 tons called for by Queensland. France is in the market for an amount put as high as 30,000 tons, but nothing has been placed in this country, as reported in London. Russia has bought several thousand tons of light rails.

Pig-iron production in February was again an index of the better output of steel, the total being

1,674,771 tons, or 59,813 tons a day, against 1,601,421 tons in January, or 51,659 tons a day. The increase of 8154 tons a day was entirely due to the blowing in of steel company furnaces. Active capacity March 1 was 63,033 tons a day, against 56,270 tons on February 1 and 176 furnaces were in blast, a gain in the month of 16 and for the past two months of 30. The present rate of pig-iron production is about 23,000,000 tons a year, as against 18,000,000 tons a year in December.

The Burlington has bought 1500 freight cars. There are still pending about 2500, or less than a week's work for the country's hungry carshops.

Structural lettings in February were somewhat more than in January, when contracts were about 25 per cent of fabricating capacity. The American Bridge Company has taken the inter-state bridge at Portland, Ore., 9000 tons, and the King Bridge Company is low bidder on the Clark Avenue bridge at Cleveland, 9400 tons, at \$51.90 erected. The American Bridge Company gets the 13,000 tons of new elevated work in Brooklyn and Lewis F. Shoemaker & Co. are low bidders on 7500 tons for the Broadway elevated line at \$37.20 delivered.

Spelter continues a disturbing element in the markets for galvanized products. Its spectacular rise and the consequent advance of galvanized sheets to 3.40c. Pittsburgh for No. 28 has practically put a stop to new buying of the latter. For galvanized wire the extra has just been increased \$2 a ton. While spelter bids fair to go higher, the diversion of demand to other metal coatings will at length become a factor.

The British Government is about to issue permits for the shipping of ferromanganese to this country in amounts variously estimated at 2500 to 5000 tons a month. Stocks here have been going down more rapidly as steel output has increased, but domestic production of ferromanganese is declining as ore supply falls off, and Great Britain's action comes none too soon.

A Comparison of Prices

Advances Over the Previous Week in Heavy Type. Declines in Italics

At date, one week, one month, and one year previous.

	Mar. 3, 1915.	Feb. 24, 1915.	Feb. 3, 1915.	Mar. 4, 1914.
Pig Iron, Per Gross Ton:				
No. 2 X, Philadelphia...	\$14.25	\$14.25	\$14.25	\$15.00
No. 2, Valley furnace...	13.00	13.00	13.00	13.25
No. 2, Southern, Cin'ti...	12.40	12.40	12.40	14.00
No. 2, Birmingham, Ala...	9.50	9.50	9.50	10.75
No. 2, furnace, Chicago*	13.00	13.00	13.00	14.25
Basic, del'd, eastern Pa...	13.50	13.50	13.50	14.50
Basic, Valley furnace...	12.50	12.50	12.50	13.00
Bessemer, Pittsburgh...	14.55	14.55	14.55	15.15
Malleable Bess., Ch'go*	13.00	13.00	13.00	14.25
Gray forge, Pittsburgh...	13.45	13.45	13.45	13.65
L. S. charcoal, Chicago...	15.75	15.75	15.75	15.25
Billets, etc., Per Gross Ton:				
Bess. billets, Pittsburgh...	19.50	19.50	19.50	21.00
O.-h. billets, Pittsburgh...	19.50	19.50	19.50	21.00
O.-h. sheet bars, P'gh...	20.50	20.50	20.50	22.00
Forging billets, base, P'gh	24.00	24.00	24.00	25.00
O.-h. billets, Phila.....	21.52	21.52	21.40	23.40
Wire rods, Pittsburgh...	25.00	25.00	25.00	26.50
Old Material, Per Gross Ton:				
Iron rails, Chicago.....	12.00	11.75	11.50	13.00
Iron rails, Philadelphia...	13.00	13.00	13.00	16.50
Carwheels, Chicago.....	10.00	10.00	10.00	12.25
Carwheels, Philadelphia...	11.00	11.00	10.50	12.75
Heavy steel scrap, P'gh...	12.00	11.75	11.50	12.25
Heavy steel scrap, Phila...	10.50	10.00	10.00	11.50
Heavy steel scrap, Ch'go...	9.75	9.75	9.25	10.00
No. 1 cast, Pittsburgh...	11.25	11.25	11.25	11.75
No. 1 cast, Philadelphia...	12.00	12.00	12.00	13.00
No. 1 cast, Ch'go (net ton)	9.00	9.00	9.00	10.50

*The average switching charge for delivery to foundries in the Chicago district is 50c. per ton.

Sheets, Nails and Wire,

	Mar. 3, 1915.	Feb. 24, 1915.	Feb. 3, 1915.	Mar. 4, 1914.
Per Lb. to Large Buyers:	Cents.	Cents.	Cents.	Cents.
Sheets, black, No. 28, P'gh.	1.80	1.80	1.80	1.95
Galv. sheets, No. 28, P'gh.	3.40	3.40	3.00	2.95
Wire nails, Pittsburgh...	1.60	1.60	1.55	1.60
Cut nails, Pittsburgh...	1.55	1.55	1.50	1.65
Fence wire, base, P'gh...	1.40	1.40	1.35	1.40
Barb wire, galv., P'gh...	2.10	2.00	1.95	2.00

Finished Iron and Steel,

	Cents.	Cents.	Cents.	Cents.
Per Lb. to Large Buyers:				
Bess. rails, heavy, at mill	1.25	1.25	1.25	1.25
Iron bars, Philadelphia...	1.15	1.20	1.20	1.27 1/2
Iron bars, Pittsburgh...	1.10	1.10	1.10	1.40
Iron bars, Chicago...	1.10	1.10	1.00	1.12 1/2
Steel bars, Pittsburgh...	1.15	1.10	1.10	1.20
Steel bars, New York...	1.319	1.269	1.26	1.36
Tank plates, Pittsburgh...	1.10	1.10	1.10	1.20
Tank plates, New York...	1.269	1.269	1.26	1.36
Beams, etc., Pittsburgh...	1.15	1.10	1.10	1.20
Beams, etc., New York...	1.319	1.269	1.26	1.36
Skelp, grooved steel, P'gh	1.10	1.10	1.10	1.25
Skelp, sheared steel, P'gh	1.15	1.15	1.15	1.35
Steel hoops, Pittsburgh...	1.25	1.25	1.20	1.30

Coke, Connellsville,

	Per Net Ton at Oven:			
Furnace coke, prompt...	\$1.50	\$1.50	\$1.50	\$1.85
Furnace coke, future...	1.65	1.65	1.65	2.00
Foundry coke, prompt...	2.00	2.00	2.00	2.50
Foundry coke, future...	2.15	2.15	2.15	2.75

Metals,

	Cents.	Cents.	Cents.	Cents.
Per Lb. to Large Buyers:				
Lake copper, New York...	15.25	15.25	15.00	15.00
Electrolytic copper, N. Y.	14.62 1/2	14.62 1/2	14.75	14.37 1/2
Spelter, St. Louis...	10.35	9.35	7.85	5.15
Spelter, New York...	10.50	9.50	8.00	5.30
Lead, St. Louis...	3.85	3.77 1/2	3.62 1/2	3.87 1/2
Lead, New York...	3.90	3.85	3.80	4.00
Tin, New York...	40.75	38.60	37.80	37.90
Antimony, Hallett's, N. Y.	22.00	19.00	17.00	7.00
Tin plate, 100-lb. box, P'gh	\$3.10	\$3.10	\$3.10	\$3.30

Finished Iron and Steel f. o. b. Pittsburgh

Freight rates from Pittsburgh in carloads; per 100 lb.: New York, 16.9c.; Philadelphia, 15.9c.; Boston, 18.9c.; Buffalo, 11.6c.; Cleveland, 10.5c.; Cincinnati, 15.8c.; Indianapolis, 17.9c.; Chicago, 18.9c.; St. Louis, 23.6c.; Kansas City, 43.6c.; Omaha, 43.6c.; St. Paul, 32.9c.; Denver, 68.6c.; New Orleans, 30c.; Birmingham, Ala., 45c.; Pacific coast, 80c. on plates, structural shapes and sheets No. 11 and heavier; 85c. on sheets Nos. 12 to 16; 95c. on sheets No. 16 and lighter; 65c. on wrought pipe and boiler tubes. The foregoing rates to the Pacific coast are by rail. The rate via New York and the Panama Canal has no stability, being dependent on vessel charges.

Plates.—Tank plates, 1/4 in. thick, 6 1/4 in. up to 100 in. wide, 1.10c. to 1.15c., base, net cash, 30 days. Following are stipulations prescribed by manufacturers, with extras:

Rectangular plates, tank steel or conforming to manufacturers' standard specifications for structural steel dated February 6, 1903, or equivalent, 1/4 in. and over on thinnest edge, 100 in. wide and under, down to but not including 6 in. wide, are base.

Plates up to 72 in. wide, inclusive, ordered 10.2 lb. per sq. ft., are considered 1/4-in. plates. Plates over 72 in. wide must be ordered 1/4 in. thick on edge or not less than 11 lb. per sq. ft., to take base price. Plates over 72 in. wide ordered less than 11 lb. per sq. ft. down to the weight of 3-16 in. take the price of 3-16 in.

Allowable overweight, whether plates are ordered to gauge or weight to be governed by the standard specifications of the Association of American Steel Manufacturers.

Extras	Cents per lb.
Gauges under 1/4 in. to and including 3-16 in.	.10
Gauges under 3-16 in. to and including No. 8.	.15
Gauges under No. 8 to and including No. 9.	.25
Gauges under No. 9 to and including No. 10.	.30
Gauges under No. 10 to and including No. 12.	.40
Sketches (including straight taper plates), 3 ft. and over	.10
Complete circles 3 ft. in diameter and over.	.20
Boiler and flange steel.	.10
"A. B. M. A." and ordinary firebox steel.	.20
Still bottom steel.	.30
Marine steel.	.40
Locomotive firebox steel.	.50
Widths over 100 in. up to 110 in., inclusive.	.05
Widths over 110 in. up to 115 in., inclusive.	.10
Widths over 115 in. up to 120 in., inclusive.	.15
Widths over 120 in. up to 125 in., inclusive.	.25
Widths over 125 in. up to 130 in., inclusive.	.50

Widths over 130 in.	1.00
Cutting to lengths, under 3 ft. to 2 ft. inclusive.	.25
Cutting to lengths, under 2 ft. to 1 ft. inclusive.	.50
Cutting to lengths, under 1 ft.	1.55

No charge for cutting rectangular plates to lengths 3 ft. and over.

Wire Products.—Fence wire, Nos. 0 to 9, per 100 lb., terms 60 days or 2 per cent. discount in 10 days, carload lots to jobbers, annealed, \$1.40; galvanized, \$1.80. Galvanized barb wire and fence staples to jobbers, \$2.10; painted, \$1.60. Wire nails to jobbers, \$1.60. Woven wire fencing, 72 per cent. off list for carloads; 71 off for 1000-rod lots; 70 off for less than 1000-rod lots.

The following table gives the price to retail merchants on fence wire in less than carloads, with the extras added to the base price:

	Plain Wire, per 100 lb.
Nos.	0 to 9 10 11 12&12 1/2 13 14 15 16
Annealed	\$1.50 \$1.55 \$1.60 \$1.65 \$1.75 \$1.85 \$1.95 \$2.05
Galvanized	2.00 2.05 2.10 2.15 2.25 2.35 2.75 2.85

Wire Rods.—Bessemer, open-hearth and chain rods, \$25.

Structural Material.—I-beams, 3 to 15 in.; channels, 3 to 15 in.; angles, 3 to 6 in. on one or both legs, 1/4 in. thick and over, and zees, 3 in. and over, 1.15c.

Wrought Pipe.—The following are the jobbers' carload discounts on the Pittsburgh basing card on steel pipe in effect from February 11, 1915, and iron pipe from February 12, 1915, all full weight.

	Steel	Iron
	Black Galv.	Black Galv.
1/4, 1/2 and 3/4	73 52 1/2	66 47
1/2	77 65 1/2	65 44
3/4	80 69 1/2	69 54
1 to 3	80 69 1/2	72 59

	Lap Weld	Reamed and Drifted
2	77 66 1/2	70 57
2 1/2 to 6	79 68 1/2	70 57
7 to 12	77 66 1/2	70 57
13 and 14	63 1/2	70 59
15	61	70 59

	Butt Weld, extra strong, plain ends	Lap Weld, extra strong, plain ends
1/4, 1/2 and 3/4	68 55 1/2	65 55
1/2	73 64 1/2	66 57
3/4 to 1 1/2	77 68 1/2	69 58
2 to 3	78 69 1/2	72 61

	Butt Weld, double extra strong, plain ends	Lap Weld, double extra strong, plain ends
1/4 to 1 1/2	63 54 1/2	60 52
1/2	66 57 1/2	62 55
2 to 2 1/2	68 59 1/2	62 55

	Butt Weld, extra strong, plain ends	Lap Weld, extra strong, plain ends
1/4, 1/2 and 3/4	68 55 1/2	65 55
1/2	73 64 1/2	66 57
3/4 to 1 1/2	77 68 1/2	69 58
2 to 3	78 69 1/2	72 61

	Butt Weld, double extra strong, plain ends	Lap Weld, double extra strong, plain ends
1/4 to 1 1/2	63 54 1/2	60 52
1/2	66 57 1/2	62 55
2 to 2 1/2	68 59 1/2	62 55

	Butt Weld, extra strong, plain ends	Lap Weld, extra strong, plain ends
1/4, 1/2 and 3/4	68 55 1/2	65 55
1/2	73 64 1/2	66 57
3/4 to 1 1/2	77 68 1/2	69 58
2 to 3	78 69 1/2	72 61

To the large jobbing trade an additional 5 per cent. is allowed over the above discounts.

The above discounts are subject to the usual variation in weight of 5 per cent. Prices for less than carloads are two (2) points lower basing (higher price) than the above discounts on black and three (3) points on galvanized.

Boiler Tubes.—Discounts to jobbers, in carloads, in effect from May 1, 1914, on steel and from January 2, 1914, on iron, are as follows:

	Lap Welded Steel	Standard Charcoal Iron
1 1/2 and 2 in.	62	45
2 1/2 in.	59	49
3 in.	65	45
3 1/2 and 4 in.	70	54
4 1/2 in.	72	57
5 and 6 in.	65	60
7 to 13 in.	62	49

Locomotive and steamship special charcoal grades bring higher prices.

2 1/2 in. and smaller, over 18 ft., 10 per cent. net extra.

2 1/2 in. and larger, over 22 ft., 10 per cent. net extra.

Less than carloads will be sold at the delivered discounts for carloads, lowered by two points for lengths 22 ft. and under to destinations east of the Mississippi River; lengths over 22 ft. and all shipments going west of the Mississippi

River must be sold f.o.b. mill at Pittsburgh basing discount, lowered by two points. On standard charcoal iron tubes for desirable orders the above discounts are shaded an extra 5, and occasionally two 5's by some makers.

Sheets.—Makers' prices for mill shipment on sheets of U. S. Standard gauge, in carload and larger lots, on which jobbers charge the usual advance for small lots from store, are as follows, f.o.b. Pittsburgh, terms 30 days net, or 2 per cent. cash discount in 10 days from date of invoice:

Blue Annealed Sheets		Cents per lb.
Nos. 3 to 8.....		1.25 to 1.30
Nos. 9 to 10.....		1.30 to 1.35
Nos. 11 and 12.....		1.35 to 1.40
Nos. 13 and 14.....		1.45 to 1.50
Nos. 15 and 16.....		1.55 to 1.60

Box Annealed Sheets, Cold Rolled		Cents per lb.
Nos. 10 and 11.....		1.45 to 1.50
No. 12.....		1.45 to 1.50
Nos. 13 and 14.....		1.50 to 1.55
Nos. 15 and 16.....		1.55 to 1.60
Nos. 17 to 21.....		1.60 to 1.65
Nos. 22 and 24.....		1.65 to 1.70
Nos. 25 and 26.....		1.70 to 1.75
No. 27.....		1.75 to 1.80
No. 28.....		1.80 to 1.85
No. 29.....		1.85 to 1.90
No. 30.....		1.95 to 2.00

Galvanized Sheets of Black Sheet Gauge		Cents per lb.
Nos. 10 and 11.....		2.40
No. 12.....		2.50
Nos. 13 and 14.....		2.50
Nos. 15 and 16.....		2.60
Nos. 17 to 21.....		2.80
Nos. 22 and 24.....		2.90
Nos. 25 and 26.....		3.05
No. 27.....		3.25
No. 28.....		3.40
No. 29.....		3.55
No. 30.....		3.70

Pittsburgh

PITTSBURGH, PA., March 2, 1915.

The leading makers advanced prices on plates, shapes and bars on Monday, March 1, to 1.15c., f.o.b. Pittsburgh, and are quoting 1.20c. on these products for second quarter delivery. This is done in the face of a quiet demand in nearly all lines, except those affected by the high price of spelter. Sales managers state that very few orders for plates, shapes and bars have been placed at 1.15c. for March shipment, but some contracts have been booked at 1.20c. for second quarter. It is thus evident that consumers consider 1.20c. on these products for second quarter delivery a better purchase than 1.15c. for March. On galvanized wire products the extras have been advanced \$2 per ton. Spelter can hardly be obtained at any price. For this reason prices on galvanized wire products, sheets and wrought pipe are very firm, and makers are not urging sales, especially those that are not well covered with spelter. The scrap market is strong, due to purchases by the Carnegie Steel Company, which, however, is now out of the market. Pig iron and coke are dull. The increased rate of operations among blast furnaces and mills is being held, but new buying is light.

Pig Iron.—W. P. Snyder & Co. report the average price of Bessemer iron for February to have been \$13.60, and basic \$12.50, both at Valley furnace, based on sales of 1000 tons or more. The Bessemer price for February is a little over 3c. less than for January, while the basic price is the same. There is no new inquiry for pig iron. Prices are weak. Small lots of foundry are being sold at \$13, up to \$13.50, at Valley furnace, for well-known brands. Foundries are taking in pig iron at a fair rate. We quote Bessemer iron at \$13.60; basic, \$12.50; malleable Bessemer, \$12.75; No. 2 foundry, \$13 to \$13.25, and gray forge, \$12.50, all at Valley furnace, with a freight rate of 95c. a ton for delivery in the Cleveland and Pittsburgh districts.

Billets and Sheet Bars.—The billet and rail sales bureau of the Carnegie Steel Company reports that its actual orders sent to the mills for rolling in February were 15,000 tons larger than in January, although February had two less working days. There is little new demand for billets or sheet bars, consumers being covered for some time ahead. The Carnegie Steel Company is not actively seeking orders for billets or sheet bars but is still selling forging billets. The company reports specifications against contracts for sheet bars

from the sheet and tin-plate mills as very active. We quote Bessemer and open-hearth billets at \$18 to \$18.50, and Bessemer and open-hearth sheet bars \$18.50 to \$19, f.o.b. maker's mills, Youngstown; Bessemer and open-hearth billets, \$19.50 to \$20, and Bessemer and open-hearth sheet bars, \$20.50 to \$21, f.o.b. maker's mills, Pittsburgh. Forging billets are quoted at \$24 for sizes up to but not including 10 x 10 in., and for carbons up to 0.25, the regular extras being charged for larger sizes and higher carbons. Forging billets running above 0.25 to 0.60 carbon take \$1 per ton extra. Axle billets are quoted at \$21 to \$22.

Ferroalloys.—The report is confirmed here that English makers have instructed their sales agents in this country to withdraw the nominal \$68 price on 80 per cent. ferromanganese, and as far as known no new price has been fixed for forward delivery. Ferromanganese for prompt shipment from stock is getting scarcer. Sales are reported in the past week of 80 per cent. for prompt delivery at prices ranging from \$97.50 to \$110, Pittsburgh. The market to-day is firm at \$105 to \$110, Pittsburgh, for prompt shipment from stock. Some of the steel companies that are not covered on ferromanganese are getting uneasy as to their future supply. No deliveries on contracts have been made in this district since England declared the embargo. We quote 50 per cent. ferrosilicon, in lots up to 100 tons, at \$73; over 100 tons to 600 tons, \$72; over 600 tons, \$71, delivered in the Pittsburgh district. On 10 per cent. ferrosilicon the quotation is \$18; 11 per cent., \$19, and 12 per cent., \$20, f.o.b. cars Jackson County, Ohio, or Ashland, Ky., furnace. We quote 20 per cent. spiegeleisen at \$25 at furnace. We quote ferrotitanium at 8c. per lb. in carloads, 10c. in 2000-lb. lots and over, and 12½c. in less than 2000-lb. lots.

Steel Rails.—The Carnegie Steel Company, through the United States Steel Products Company, has received some fairly large orders for standard section rails for export, and a good part of the output of heavy rails at the Edgar Thomson mills is going abroad. No large inquiries are in the market from domestic roads. The new demand for light rails is active, sales by the Carnegie Steel Company in February having been more than 3000 tons heavier than in January. We quote standard section rails made of Bessemer stock at 1.25c., and of open-hearth 1.34c., f.o.b. Pittsburgh. We quote light rails as follows, in carload lots: 8 and 10 lb. section, 1.275c.; 12 and 14 lb., 1.225c.; 16 and 20 lb., 1.175c.; 25, 30, 35, 40 and 45 lb. sections, 1.125c.

Structural Material.—While some fairly large jobs are in the market they are slow in being closed up. The elevated track work and new station at Indianapolis for the Pennsylvania Lines West, involving about 19,000 tons, may not be given out for some time. A terminal warehouse to be located at Thirteenth and Etna streets in this city is under way, and if it goes through will take about 5000 tons. The Carnegie Steel Company and the Jones & Laughlin Steel Company have advanced prices on beams and channels up to 15 in. to 1.15c. for March shipment, with the usual extras, and 1.20c. for second quarter delivery. We quote the market at these figures.

Plates.—The Government is in the market for about 350 tons of plates and shapes for torpedo-boat destroyer No. 63 to be built at the Mare Island Navy Yard. No new orders for cars have been placed, but the Missouri, Kansas & Texas has an inquiry out for 1000 freight cars and 200 general service cars, while the Illinois Central is taking bids on 100 gondolas. All the steel car companies are very short of work and are taking in a minimum amount of plates and steel bars. Leading plate mills on March 1 advanced quotations on ¼-in. and heavier plates to 1.15c. for March delivery and 1.20c. for second quarter. As yet very few orders have been placed at 1.15c.

Sheets.—No further advance in the price of galvanized sheets has been made, but some mills are not anxious to sell even on the basis of 3.40c. for No. 28. Others will enter orders for prompt shipment at this price, but will not allow cancellations and will not sell for forward delivery, shipping directions to accompany the orders. Some jobbers and large consumers are trying

to place orders for galvanized at less than the price above named, but the mills are turning down such business. Another conference between the sheet mills that sign the Amalgamated scale and the Amalgamated Association officials may be held this week. It is stated that there has been a change of sentiment among sheet-mill workers and that the men may accept the proposed reduction. The sheet mills of the Brier Hill Steel Company at Niles, Ohio, are idle this week, while several other sheet mills that sign the scale are running to 60 and 75 per cent. and are paying the scale rate for the time being. The new demand for black and galvanized sheets is fairly active, and the market is very firm. We quote No. 28 Bessemer black sheets at 1.80c. to 1.85c., No. 28 galvanized at 3.40c., Nos. 9 and 10 blue annealed sheets 1.30c. to 1.35c.; No. 30 black plate, tin-mill sizes, H. R. & A., 1.95c.; No. 28, 1.90c.; Nos. 27, 26 and 25, 1.85c.; Nos. 22 to 24, 1.80c.; Nos. 17 to 21, 1.75c.; Nos. 15 and 16, 1.70c. The above prices are for carload lots, f.o.b. at maker's mill, jobbers charging the usual advances for small lots from store.

Tin Plate.—There has been a notable increase in specifications against contracts, and several of the mills now running to about 75 per cent. of capacity expect to be running full within the next week or so. The American Sheet & Tin Plate Company is running to nearly 100 per cent. Prices are firm, due to the high price of pig tin, and sales of small lots are being made at \$3.15 to \$3.20 per base box. We quote bright plate at \$3.10 to \$3.20 per base box, f.o.b. Pittsburgh.

Wire Rods.—Foreign inquiry has quieted down and very little is being done. The domestic demand is dull, as consumers are covered by contracts. We quote Bessemer, open-hearth and chain rods at \$25 to \$25.50, Pittsburgh. One maker reports having made several small sales of Bessemer rods at the higher price.

Shafting.—The market has a firmer tone, due to the higher prices quoted on steel bars, but as yet prices of shafting have not shown an actual advance. The makers will shortly announce new extras on shafting, which are now being prepared. Specifications against contracts from the implement trade and automobile builders are heavy. We quote cold-rolled shafting at 67 to 68 per cent. off, delivered in base territory, depending on the order.

Railroad Spikes.—New inquiry is dull, as nearly all the railroads have covered their needs for 1915. Specifications are coming in at a good rate, shipments to start late this month and early in April. Prices are firm. We quote standard railroad spikes at \$1.35 to \$1.40, and small spikes at \$1.45 to \$1.50 in carload and larger lots, f.o.b. Pittsburgh.

Skelp.—Makers report a heavier demand than for some time. Prices are firmer. Local trade has been helped by foreign orders for skelp, of which quite a number have been filled from Pittsburgh mills. We quote grooved steel skelp, 1.10c. to 1.15c.; sheared steel skelp, 1.15c. to 1.20c.; grooved iron skelp, 1.50c.; sheared iron skelp, 1.50c. to 1.60c., delivered to consumers' mills in the Pittsburgh district.

Hoops and Bands.—Effective March 1, the Carnegie Steel Company and other makers of bands advanced the price to 1.15c. for March shipment and 1.20c. for second quarter. Prices on hoops are firmer and makers report that specifications against contracts for both hoops and bands are coming in freely. We quote steel bands at 1.15c. for March delivery and 1.20c. for second quarter, with extras as per the steel bar card. Prices on steel hoops are firm at 1.25c. to 1.30c. at mill.

Wire Products.—Prices on galvanized wire products have been advanced \$2 per ton, but there has been no change in wire nails or plain annealed wire. The market on new orders on wire nails remains at \$1.60, but the trade is covered at \$1.55, and there are still a few contracts at \$1.50 on which shipments have not been completed. We now quote on new orders wire nails at \$1.60; plain annealed wire, \$1.40; galvanized barb wire and fence staples, \$2.10; painted barb wire, \$1.60, all f.o.b. Pittsburgh, freight added to point of delivery, terms 30 days net, less 2 per cent. for cash in 10 days. We quote woven wire fencing at 72½ per cent. off in carload lots, 71½ per cent. off on 1000-rod lots and 70½ per cent. on small lots, f.o.b. Pittsburgh.

Iron and Steel Bars.—Effective Monday, March 1, the leading makers advanced prices on steel bars to 1.15c. for March and 1.20c. for second quarter delivery. It is stated that some contracts have been placed for second quarter at 1.20c. but very few orders for March at 1.15c. Shipments are still going out on contracts placed in December and early January at 1.05c. to 1.10c., and also on definite orders placed in February at 1.10c. on which deliveries were not completed by the mills. On all new orders the large makers are quoting 1.15c. for March delivery and will not shade it. Specifications against contracts are active and shipments by the mills are heavy. The new demand for iron bars is quiet, but the market is firmer. We quote steel bars for March shipment at 1.15c. and for second quarter 1.20c., f.o.b. Pittsburgh. Common iron bars, made from part scrap, are 1.10c. to 1.15c., maker's mill.

Merchant Steel.—New demand is heavier and shipments by the mills against orders and contracts are larger than for some time. Prices on small lots for prompt shipment are as follows: Iron finished tire, ½ x 1½ in., and larger, 1.30c., base; under ½ x 1½ in., 1.45c.; planished tire, 1.50c.; channel tire, ¾ to 1 in. and 1 in., 1.80c. to 1.90c.; 1½ in. and larger, 1.90c.; toe calk, 1.90c. to 2c., base; flat sleigh shoe, 1.65c.; concave and convex, 1.70c.; cutter shoe, tapered or bent, 2.20c. to 2.30c.; spring steel, 1.90c. to 2c.; machinery steel, smooth finish, 1.70c.

Cold-Rolled Strip Steel.—The new demand is quiet, as nearly all consumers are covered by contracts up to April, and in some cases to July. Specifications are coming in at quite a good rate. Prices are firm, but no higher. We quote hard-rolled steel, 1½-in. and wider, under 0.20 carbon, sheared or natural mill edges, per 100 lb., \$2.75 delivered. Extras, which are standard among all the mills, are as follows:

Thickness, in.	Extras for thickness	Extras for soft or intermediate tempers	Extras for straightening and cutting to lengths not less than 24 in.
0.100 and heavier.....	Base	\$0.25	\$0.10
0.099 to 0.050.....	\$0.05	0.25	0.15
0.049 to 0.035.....	0.20	0.25	0.15
0.034 to 0.031.....	0.35	0.40	0.25
0.030 to 0.025.....	0.45	0.40	0.40
0.024 to 0.020.....	0.55	0.40	0.50
0.019 to 0.017.....	0.85	0.50	1.10
0.016 to 0.015.....	1.25	0.50	1.10
0.014 to 0.013.....	1.95	0.50	1.25
0.012.....	2.30	0.50	coils only
0.011.....	2.65	0.50	coils only
0.010.....	3.00	0.50	coils only

Wrought Pipe.—Nearly all makers report that orders entered for tubular goods in February were much heavier than in January, and a still further increase is looked for in March. Another advance in prices on galvanized wrought-iron and steel pipe is looked for at any time on account of the very high spelter market. Discounts on iron and steel pipe are firmly held.

Boiler Tubes.—Mills report the new demand for locomotive and merchant tubes quiet and mostly for small lots. Large consumers of boiler tubes are covered ahead on contracts and specifications are fairly good. Discounts continue to be materially shaded.

Coke.—There is prospect of some early demand for furnace coke, as several merchant furnaces in the two valleys that have not covered on coke are reported to be getting ready to go in blast. Prices are only fairly strong. The Connellsville Courier reports the output of coke in the upper and lower Connellsville regions for the week ended February 20 to have been 271,090 tons, an increase over the previous week of 20,235 tons, the heaviest increase shown in any one week for some time. We quote standard makes of blast-furnace coke for prompt shipments from \$1.50 to \$1.60; on contracts for delivery up to July 1, \$1.65, and for delivery over all of 1915, at \$1.75 per net ton at oven. Standard makes of 72-hr. foundry coke are held at about \$2 for prompt shipment and from \$2.15 up to \$2.50 on contracts.

Old Material.—The local scrap market is strong, due largely to reported purchases of 10,000 tons or more of selected-heavy steel scrap by the Carnegie Steel Company for delivery at its Homestead works. The price is reported to have been \$12.50, delivered, but this is not confirmed. Some dealers are now holding scrap at

\$12.50 minimum and believe it will soon reach \$13. The consumption of scrap is steadily increasing. While it is said that dealers' stocks are very low, on the other hand several large consumers in this district are well supplied and would not buy at present prices asked. The absolute minimum on heavy steel scrap is \$12, some dealers quoting from \$12.50 to \$13, delivered, but so far as known no sales of heavy steel scrap have been made above \$12.50. There is some demand for borings and turnings and the whole market is firm. For delivery to consumers' mills in the Pittsburgh and other consuming districts that take Pittsburgh freights dealers quote as follows:

Heavy steel melting scrap, Steubenville, Follansbee, Brackenridge, Sharon, Monessen, Midland and Pittsburgh delivery	\$12.00 to \$12.50
Compressed side and end sheet scrap No. 1 foundry cast	10.25 to 10.50
Bundled sheet scrap, f.o.b. consumers' mills, Pittsburgh district	11.25 to 11.50
Rerolling rails, Newark and Cambridge, Ohio, Cumberland, Md., and Franklin, Pa.	9.25 to 9.50
No. 1 railroad malleable stock	11.75 to 12.00
Railroad grate bars	10.00 to 10.25
Low phosphorus melting stock	8.50 to 8.75
Iron car axles	13.25 to 13.50
Steel car axles	18.75 to 19.25
Locomotive axles, steel	13.25 to 13.75
No. 1 busheling scrap	19.75 to 20.25
No. 2 busheling scrap	9.75 to 10.00
Machine shop turnings	7.00 to 7.25
Old carwheels	7.50 to 7.75
Cast-iron borings	10.75 to 11.00
Sheet bar crop ends	8.00 to 8.25
Old iron rails	12.00 to 12.25
No. 1 railroad wrought scrap	12.75 to 13.00
Heavy steel axle turnings	10.75 to 11.00
Heavy breakable cast scrap	8.50 to 8.75
	10.75 to 11.00

*Shipping point.

Chicago

CHICAGO, ILL., March 3, 1915.—(By Wire.)

Heavier specifications in the few days preceding March 1, on which date the advance in the price of heavy steel products to the basis of 1.15c., Pittsburgh, became effective, are generally reported. There is little doubt that users of shapes and bars, in particular, are covered for all of their first-quarter requirements and the major portion of their normal first-half needs on the basis of 1.10c., Pittsburgh. Rail transactions presented the most interesting events of the week and an aggregate of more than 45,000 tons is known to have been placed. Of this 5000 tons for the Illinois Central was taken by the Algoma (Canada) mill. In the remaining business, nearly all of the leading domestic mills participated. Car orders secured by builders call for approximately 2500 gondolas and box cars. The tonnage of fabricated steel reported as placed approached 3000 tons, of which the largest contract is that for the Lyon & Healy building, involving 1648 tons. Plate tonnage has fallen off somewhat from the rate of business booked in the preceding fortnight. Users of galvanized sheets are following the natural course of specifying to the full limit of their low priced contracts, but very little business is being done at the level of quotations necessitated by present spelter conditions. The pig-iron market is not generally active, although a few important transactions recently closed have been the occasion of competition sufficiently keen to test severely the strength with which prices are being held. Cast-iron pipe inquiry includes 12,000 tons for Cleveland. Scrap prices are slightly easier and melters have found it possible to cover their early requirements freely at present prevailing prices.

Pig Iron.—The general run of business in the pig iron market has to do with very modest tonnages only and inquiry is decidedly light. Exceptions to this general status are found in the purchase of a round tonnage of foundry and silvery irons for eastern Wisconsin delivery and in the inquiry of the leading radiator manufacturer. While for the ordinary run of business the price of \$13, f.o.b. furnace, for Northern No. 2 is being maintained, with possibly increasing firmness as regards grade differentials, the occasional more attractive tonnage brings out closer prices. For recent business of the latter kind it is stated with authority

that prices have been made for last half delivery which figure lack to \$12.75 for No. 2 at Chicago furnace although the iron is understood to have been placed for shipments from the South from a steel company furnace and from the Milwaukee district. Southern iron continues to bring \$9.50, Birmingham, and in this market only a very limited demand exists. The charcoal iron situation is held well in hand. The following quotations are for iron delivered at consumers' yards, except those for Northern foundry, malleable Bessemer and basic iron, which are f.o.b. furnace and do not include a switching charge averaging 50c. a ton:

Lake Superior charcoal, Nos. 2 to 5	\$15.75
Lake Superior charcoal, No. 1	16.25
Lake Superior charcoal, No. 6 and Scotch	16.75
Northern coke foundry, No. 1	\$13.25 to 13.75
Northern coke foundry, No. 2	13.00 to 13.25
Northern coke foundry, No. 3	12.50 to 13.00
Southern coke, No. 1 f'dry and 1 soft	13.75 to 14.25
Southern coke, No. 2 f'dry and 2 soft	13.50 to 13.75
Malleable Bessemer	13.00 to 13.25
Standard Bessemer	13.00
Basic	12.50 to 13.00
Low phosphorus	20.00 to 20.50
Jackson Co. and Ky. silvery, 6 per cent.	16.90 to 17.40
Jackson Co. and Ky. silvery, 8 per cent.	17.90 to 18.40
Jackson Co. and Ky. silv'y, 10 per cent.	18.90 to 19.40

(By Mail)

Rails and Track Supplies.—The invasion of the local market by the Algoma Steel Company, which is understood to have taken 5000 tons of rails for the Illinois Central Railroad, is of first importance. The total prior bookings of the Canadian mill are estimated at about 22,000 tons, chiefly for Central Western delivery. The week also brought the closing of other interesting rail business, which included 20 000 tons for the Northern Pacific, 10 000 tons for the Great Northern, 6000 tons for the Burlington and 5400 tons for the Omaha. The mills with which these orders were placed include the Illinois Steel Company, Lackawanna Steel Company, Colorado Fuel & Iron Company, Cambria Steel Company and Bethlehem Steel Company. Inquiry for track materials includes a round tonnage of tie plates for a Western trunk line. We quote standard railroad spikes at 1.50c. to 1.60c., base; track bolts with square nuts, 1.90c. to 2c., base, all in carload lots, Chicago; tie plates, \$23.50 to \$25, f.o.b. mill, net ton; standard section Bessemer rails, Chicago, 1.25c., base; open-hearth, 1.34c.; light rails, 25 to 45 lb., 1.07c.; 16 to 20 lb., 1.12c.; 12 lb., 1.17c.; 8 lb., 1.22c.; angle bars, 1.50c., Chicago.

Structural Material.—Specifications for plain material from mill, by their increase in the past few days, indicate a very general anticipation of requirements in view of the advance in prices to the basis of 1.15c., Pittsburgh. This activity contributed to a better tonnage showing for February than was made in January and continues the gradual increase in mill bookings which has been made at the rate of about 10 per cent. per month since November. Contracts for fabricated steel reported placed last week include 1648 tons for the Lyon & Healy building, Chicago, to the American Bridge Company; 421 tons for the R. J. Gunning store and office building, Chicago, to the Kenwood Bridge Company; 305 tons for a freight shed at New Orleans, to the American Bridge Company, and other smaller contracts, bringing up the aggregate tonnage to about 3000 tons. The Burlington has closed for the cars for which inquiry was made recently, placing 1500 with the Haskell & Barker Car Mfg. Company, which will also build 750 for the Santa Fe. The Missouri, Kansas & Texas is in the market for 1200 cars and 40 locomotives. Prices for fabricated steel for erection in Chicago continue to hover around very low levels and one large contract was recently taken at considerably under \$40 per ton. Prices for plain-material tonnage of miscellaneous character appear to be well maintained on the basis of 1.10c., Pittsburgh, with a prospect for the same policy on the 1.15c. basis, but concessions to buyers of large lots are now, as ordinarily, the rule. We quote for Chicago delivery of plain shapes from mill 1.289c. to 1.339c.

We quote for Chicago delivery of structural material from stock 1.75c.

Plates.—An activity among tank builders and boiler shops in the past several weeks somewhat out of proportion to the general business activity has been re-

sponsible for the larger portion of plate tonnage booked by local mills. There has been some falling off in this business in the past week and one mill, which has been running on double turn is now on a single-turn schedule. The plate market, which has been confessedly weak, is placed, with the advance announced for March 1, on the same basis as other finished steel products, but assurance is lacking that this price for plates will be other than nominal. We quote for Chicago delivery of plates from mill 1.25c. to 1.339c.

We quote for Chicago delivery of plates from store 1.75c.

Sheets.—Specifications against galvanized sheet contracts, made at the prices prevailing before the development of the acute situation in spelter, are crowding into the mills. Few of the mills were fortunate enough to be protected in their spelter supply to the full extent of their contract obligations and the situation is working no small hardship. The mills are practically unable to obtain spelter at any price for immediate shipment so that quotations on new business in galvanized sheets, while nominally 3.40c., Pittsburgh, are very unsettled at any figure. Little business is being done at the high prices. The tonnage in black sheets has been sympathetically affected in a slight degree inasmuch as painted sheets are being substituted, in some cases for the galvanized product. We quote for Chicago delivery from mill: No. 10 blue annealed, 1.489c. to 1.539c.; No. 28 black, 1.939c. to 1.989c.; No. 28 galvanized, 3.589c.

We quote for Chicago delivery from jobbers' stocks as follows, minimum prices applying on bundles of 25 or more: No. 10 blue annealed, 1.95c.; No. 28 black, 2.55c.; No. 28 galvanized, 3.65c. to 3.75c.

Bars.—The mills of this district rolling bar iron have been able to bring their operations up to a scale of from 65 to 70 per cent. of capacity. In keeping with this improved operating situation, bar-iron prices are now at a minimum of 1.10c., Chicago. Hard-steel bar business is fair but the demand for mild steel is very limited. We quote for mill shipments as follows: Bar iron, 1.10c.; soft steel bars, 1.289c. to 1.339c.; hard steel bars, 1.20c.; shafting in carloads, 65 to 68 per cent. off; less than carloads, 60 to 65 per cent. off.

We quote store prices for Chicago delivery: Soft steel bars, 1.65c.; bar iron, 1.65c.; reinforcing bars, 1.65c. base, with 5c. extra for twisting in sizes $\frac{1}{2}$ in. and over and usual card extras for smaller sizes; shafting 62 per cent. off.

Rivets and Bolts.—The market of the past week brought out no special transactions and business was generally quiet. Manufacturers of nuts and bolts appear to be taking a more decided position in the maintenance of prices. The rivet situation shows no change. Our quotations are as follows: Carriage bolts up to $\frac{3}{4}$ x 6 in., rolled thread, 80-20; cut thread, 80-15; larger sizes, 80; machine bolts up to $\frac{3}{4}$ x 4 in., rolled thread, 80-25; cut thread, 80-20; larger sizes, 80-5; coach screws, 85-5; hot pressed nuts, square, \$6.80 to \$6.60 off per cwt.; hexagon, \$7.80 to \$7.60 off per cwt. Structural rivets, $\frac{3}{4}$ to $1\frac{1}{4}$ in., 1.50c. to 1.55c., base, Chicago, in carload lots; boiler rivets, 10c., additional.

We quote out of store: Structural rivets, 2c.; boiler rivets, 2.10c.; machine bolts up to $\frac{3}{4}$ x 4 in., 75-15; larger sizes, 70-10-10; carriage bolts up to $\frac{3}{4}$ x 6 in., 75-10; larger sizes, 70-15 off; hot pressed nuts, square, \$6, and hexagon, \$6.70 off per cwt.

Wire Products.—The movement of wire continues to show larger tonnages with a very satisfactory maintenance of prices. The nail trade is materializing to meet the demands of normal spring requirements while weather conditions throughout large portions of the farming area have been very favorable to the buying of fences. The extra on galvanized wire, No. 18 and coarser, and barb wire has been advanced \$2 a ton. We quote to jobbers as follows: Plain wire, No. 9 and coarser, base, \$1.589; wire nails, \$1.789; painted barb wire, \$1.789; galvanized, \$2.189; polished staples, \$1.789; galvanized, \$2.189, all Chicago.

Cast-Iron Pipe.—Cast-iron pipe tonnage placed last week included 4250 tons at Portland, Ore., taken by the leading interest, which was low bidder also on 2500 tons at Minneapolis; 1000 tons was taken at Laramie,

Wyo., and at Faribault, Minn., the American Cast Iron Pipe Company was awarded 300 tons. The city of Cleveland is in the market for 12,000 tons, while at Ft. Wayne, Ind., and Chillicothe, Mo., small tonnages are to be placed in the current week. We quote as follows, per net ton, Chicago: Water pipe, 4 in., \$25.50; 6 to 12 in., \$23.50; 16 in. and up, \$23, with \$1 extra for gas pipe.

Old Material.—The Chicago market had shown consistent tendencies toward higher prices up to the middle of last week. This strength was largely in sympathy with a local demand for heavy melting steel, supported by strength in Eastern markets and a fair demand for rolling-mill scrap. Dealers were conserving their holdings and consumers found difficulty in covering, but in the last few days the situation appears to have become considerably easier. With the placing of several thousand tons of heavy melting steel and of busheling scrap, present needs of the melters appear to have been satisfied, and prices, while in most instances no lower, are somewhat softer. Railroad offerings include a heavy list from the Pennsylvania Lines West, 9000 tons from the Baltimore & Ohio, 2000 tons from the Rock Island, and a list from the New York Central Lines. We quote for delivery at buyers' works, Chicago and vicinity, all freight and transfer charges paid, as follows:

Per Gross Ton

Old iron rails	.....	\$12.00 to \$12.25
Old steel rails, rerolling	.....	10.25 to 10.75
Old steel rails, less than 3 ft.	.....	10.25 to 10.50
Old carwheels	.....	10.00 to 10.50
Heavy melting steel scrap	.....	9.75 to 10.25
Frogs, switches and guards, cut apart	.....	9.75 to 10.25
Shoveling steel	.....	9.25 to 9.75
Steel axle turnings	.....	7.25 to 7.50

Per Net Ton

Iron angles and splice bars	.....	\$11.50 to \$12.00
Iron arch bars and transoms	.....	11.75 to 12.25
Steel angle bars	.....	8.50 to 9.00
Iron car axles	.....	13.75 to 14.25
Steel car axles	.....	11.50 to 12.00
No. 1 railroad wrought	.....	9.00 to 9.50
No. 2 railroad wrought	.....	8.50 to 9.00
Cut forge	.....	8.50 to 9.00
Steel knuckles and couplers	.....	8.75 to 9.00
Steel springs	.....	9.25 to 9.75
Locomotive tires, smooth	.....	8.50 to 9.00
Machine shop turnings	.....	5.50 to 6.00
Cast borings	.....	4.75 to 5.25
No. 1 busheling	.....	8.00 to 8.50
No. 2 busheling	.....	7.00 to 7.25
No. 1 boilers, cut to sheets and rings	.....	5.50 to 6.00
Boiler punchings	.....	8.25 to 8.50
No. 1 cast scrap	.....	9.00 to 9.25
Stove plate and light cast scrap	.....	8.25 to 8.50
Grate bars	.....	8.00 to 8.25
Railroad malleable	.....	8.00 to 8.25
Agricultural malleable	.....	7.25 to 7.50
Pipes and flues	.....	7.00 to 7.50

Matthew Addy & Co., Cincinnati, have closed their Chicago office, in the Rookery Building, for the sale of pig iron and coke. This removes, from Chicago representation, the first pig-iron house to handle Southern iron through a Chicago office. Matthew Addy & Co. had had a representative in that city continuously since 1881.

Philadelphia

PHILADELPHIA, PA., March 2, 1915.

The closing week of February was disappointing to those makers of finished materials who anticipated heavier buying previous to the advance of \$1 per ton, effective March 1, on the leading classes of finished materials, for delivery in the current month. Plates, structural shapes and steel bars are now generally quoted at the 1.15c., Pittsburgh, base, for March and 1.20c., Pittsburgh, for second quarter shipment. Specifications, as a rule, have been lighter than earlier in February. Mill activities, however, continue on an even basis. Complications in quotations, due to the recent advances in freight rates, continue to arise, but consumers pay the higher rates without much question. The lack of railroad buying continues an important factor. Locomotive and steel car builders have contributed but little business in rolled products and the outlook for an early improvement is not encouraging. The pig-iron market is spotty. Following recent heavy buying in low grade irons the market is

inclined to be dull. Small lot transactions in the export trade are more promising. The ferromanganese situation is unchanged. Old material, while not any more active, is stronger, due to contemplated buying by some of the large consumers.

Iron Ore.—No fresh demand has developed. Importations in the week ended February 27 were confined to 12,850 tons from Chile.

Pig Iron.—While there has been little gain in consumption, the more numerous requests that shipments be hurried foster a belief that the melt in foundry grades is taking an upward turn. Though the individual betterment may be small, the aggregate will be considerable. Pig-iron producers in this district anticipate a decrease of stocks in furnace yards when February statistics become available. Several 500-ton lots in the higher grades are up for quotations, together with the usual run of small-lot business, but current sales have been confined mostly to small quantities for early shipment. In the majority of cases a slightly higher price level prevails, sellers being disposed to hold at \$13.75 to \$14, furnace, for standard brands of No. 2 X foundry iron. In cases \$14.75 delivered has been done for small prompt business. On desirable orders, however, some furnaces will still accept orders on a \$14.25, delivered, basis for No. 2 X. At the same time \$14.25 delivered has been obtained by some sellers for No. 2 plain. As a rule, transactions are governed by individual conditions. Virginia foundry is dull. Some producers find their sales in February were smaller than for any month for a long period. Following the recent large-lot buying of low grade iron by a Delaware River cast-iron pipe maker, the demand for that grade has been quiet. Southern No. 2 foundry is available, it is said, at \$9.25, Birmingham, for early shipment, while \$9.50 would probably be done for quantity business for second half. Considerable is still heard of foreign inquiry for analysis iron, equivalent to Bessemer and low phosphorus grades, but little actual business has been done by sellers in this district. Shipping interests are not anxious for odd-lot shipments, owing to the delay entailed in the loading and unloading. The demand for low phosphorus for domestic consumption has been confined to odd lots. Little inquiry for basic is reported. Quotations for standard brands for early delivery in buyers' yards in this district are as follows:

Eastern Penna. No. 2 X foundry	\$14.25 to \$14.50
Eastern Penna. No. 2 plain	14.00 to 14.25
Virginia No. 2 X foundry	15.25
Virginia No. 2 plain	15.00
Gray forge	13.25 to 13.50
Basic	13.50
Standard low phosphorus	20.00 to 20.50

Ferroalloys.—Disagreements among English makers, as to tonnage allotments, are holding up the shipment of 5000 tons per month of ferromanganese, authorized under license, by the British Government. Consumers are anxiously awaiting some settlement. In the meantime, stocks are gradually receding. Some resale ferromanganese has come out and as high as \$125 per ton is reported to have been paid for small lots. The recent \$68, seaboard, quotation for 80 per cent. English ferromanganese practically has been withdrawn, as sellers in this country have been advised to accept no further business. Sales of 80 per cent. ground ferromanganese in 100 to 1000-lb. lots have been made at 6c. per lb. Domestic 20 per cent. spiegeleisen has been purchased at prices ranging from \$26 to \$28 per ton, f.o.b., furnace. No open quotation is made for this grade, each transaction being on its own basis. A recent sale of 1000 tons is reported.

Bars.—Specifications for steel bars have been lighter. New business, in view of the price advance, did not measure up to the expected mark last week. Current business is light, buyers awaiting developments as to prices. Sellers are holding the 1.15c., Pittsburgh, base equal to 1.309c. here, and ask \$1 advance for second quarter contracts. Little new business in concrete bars has developed. In view of advances in prices of steel bars makers of iron bars hope to obtain better prices, but developments in that direction have been meager. Ordinary iron bars are

quoted from 1.15c. to 1.20c., and at that are inclined to be easy.

Plates.—The leading makers are quoting the dollar advance, effective March 1, for shipment in that month, but it is too early to see what the result will be. On heavy tonnage business old options frequently apply. An Eastern mill was the low bidder on a large tonnage of plates for a battleship. Considerable shipbuilding tonnage is before the trade, as about 20 merchant vessels are contemplated. No definite contracts for vessels were closed during the week. The lack of railroad and locomotive buying is keenly felt by the trade. General specifications are reported a trifle better and some of the Eastern mills are operating at a 70 to 80 per cent. basis. Prices are held at 1.309c., Philadelphia, carload lots, for March delivery, with a dollar a ton advance for second quarter. Some mills will not consider business for extended delivery at this time.

Steel Rails.—While no important orders for steel rails have transpired in this market, several allotments on previous contracts are reported. The Northern Pacific has divided its 20,000 tons between the Lackawanna and Illinois steel companies. The Great Northern has distributed 10,000 tons—5000 to Lackawanna, 3500 to Illinois, 1000 to Bethlehem and 500 to Cambria. The recent inquiry of the Virginian Railway for 2400 tons has not yet resulted in a contract. Some inquiry for girder rails is reported, but the tonnage is not large.

Structural Material.—The general run of business is unsatisfactory, both as to tonnage and prices. A Philadelphia fabricator was the low bidder on 7500 tons for elevation work in Brooklyn, N. Y. Inquiries are out for several bridges for the Pennsylvania Railroad, none of which involves any large tonnage. Several contracts for elevation work are expected to be placed in the near future. Building work drags. Plain structural shapes were advanced March 1 to 1.309c., carload lots, delivered here, and no trouble has been experienced in obtaining this price on miscellaneous business, but the market has not been tested by large inquiry.

Sheets.—Eastern mills note little betterment in conditions. Mills are able to keep running on small orders, but there is little quantity business offered. Prices are a shade firmer, 1.35c., Pittsburgh, being more closely adhered to for No. 10 blue annealed sheets.

Billets.—The market continues dull. Some demand for export is still before the trade, but little interest is shown in this business by Eastern mills. Prices are unchanged at \$21.52 minimum, for basic open-hearth rolling billets, delivered in this district. Forging billets command about \$4 advance, dependent upon specifications.

Old Material.—The market has a stronger appearance, not due so much to business done, but rather to the willingness of consumers to talk business. Heavy melting steel, particularly, is stronger and some mills would pay \$10.50 for moderate-sized lots. In view of conditions sellers are disinclined to sell at that figure. One buyer would probably take from 5000 to 10,000 tons at a price acceptable to him. Low phosphorus scrap is also firmer, while railroad wrought has more strength. Quotations for delivery in buyers' yards in this district, covering eastern Pennsylvania and taking freight rates from 35c. to \$1.35 per gross ton, are as follows:

No. 1 heavy melting steel	\$10.50 to \$10.75
Old steel rails, rerolling	10.50 to 11.00
Low phosphorus heavy melting steel	14.25 to 14.50
scrap	14.00 to 14.50
Old steel axles	14.00 to 14.50
Old iron axles	17.50 to 18.00
Old iron rails	13.00 to 14.00
Old carwheels	11.00 to 11.50
No. 1 railroad wrought	12.50 to 13.00
Wrought-iron pipe	10.00 to 10.50
No. 1 forge fire	8.00 to 8.50
Bundled sheets	8.00 to 8.50
No. 2 busheling	7.75 to 8.25
Machine shop turnings	8.00 to 8.50
Cast borings	8.00 to 8.50
No. 1 cast	12.00 to 12.50
Grate bars, railroad	8.50 to 9.00
Stove plate	8.50 to 9.00
Railroad malleable	9.00 to 9.50

Coke.—There is very little demand for either furnace or foundry grades. Prompt standard Connells-ville furnace coke ranges from \$1.50 to \$1.60 per net ton at oven and \$1.65 to \$1.70 for shipment over the remainder of the first half. Standard Connells-ville foundry coke is quoted at \$2 to \$2.10 for prompt and \$2.15 to \$2.50 for contract. Freight rates from the principal producing districts are as follows: Connells-ville, \$2.05; Latrobe, \$1.85; Mountain, \$1.65.

Cincinnati

CINCINNATI, OHIO, March 3, 1915.—(By Wire.)

Pig Iron.—A local melter has purchased approximately 500 tons of mixed Northern and Southern iron for shipment by July 1. A sale of 1000 tons of Northern iron is reported as made to a central Ohio consumer, for the same delivery. Other sales that have come to light are for small lots of foundry iron for nearby delivery. A southern Indiana firm is expected to buy a round lot of both Northern and Southern grades before the week is over. There is also a pending deal at Indianapolis for 800 tons that will be closed soon. The largest new inquiry is from a local foundry for 1500 tons for last half shipment, only a small part of which is for Northern iron, the remainder being made up of Southern grades. An Ohio melter is asking for 600 tons of Northern foundry for shipment in the next four months. The amount of business that is under quiet negotiation is said to be smaller than for some time. There is a tendency on the part of many Southern furnaces to hold their strictly last half quotations at a higher level. The records for the months of January and February of this year are much behind the corresponding period of last year when there was comparatively heavy contracting for third and fourth quarter shipment. At present most buyers are indisposed to contract far ahead, but on the other hand a number of furnaces are hesitating to open their books at present prices for future delivery. The foundries in this vicinity are melting a fair tonnage of iron, although stove manufacturers are not doing so well. Based on freight rates of \$2.90 from Birmingham and \$1.26 from Iron-ton, we quote, f.o.b. Cincinnati, as follows:

Southern coke, No. 1 f'dry and 1 soft.	\$12.90 to \$13.40
Southern coke, No. 2 f'dry and 2 soft.	12.40 to 12.90
Southern coke, No. 3 foundry.	11.90 to 12.40
Southern No. 4 foundry.	11.40 to 11.90
Southern gray forge	10.90 to 11.40
Ohio silvery, 8 per cent. silicon.	16.26 to 16.51
Southern Ohio coke, No. 1.	15.01 to 15.51
Southern Ohio coke, No. 2.	14.01 to 14.51
Southern Ohio coke, No. 3.	13.76 to 14.01
Southern Ohio malleable Bessemer.	14.26
Basic, Northern	14.26
Lake Superior charcoal	15.25 to 17.25
Standard Southern carwheel.	26.90 to 27.40

(By Mail)

Coke.—No new business is under negotiation for either furnace or foundry coke. A few carload lots of 72-hr. coke are being bought by scattered consumers. Specifications on old contracts are said to be fairly satisfactory. Furnace coke is quoted in all three fields around \$1.50 to \$1.75 per net ton at oven and foundry coke ranges from \$2 to \$2.50 with a few favorite brands held at \$2.75.

Finished Material.—The advance on No. 28 galvanized sheets to 3.40c., Pittsburgh, has not cut off new business by any means. A number of orders are reported from customers whose requirements are urgent. While there has been some disposition among buyers to contract ahead at the figure named the mills are only willing to accept orders with specifications attached, due to the uncertainty as to the future price of spelter. No. 28 black sheets are quoted at 1.90c., Pittsburgh, but there is not much business reported. Leading local warehouses state that February business in finished material, such as steel bars, structural shapes, etc., was fully 10 per cent. ahead of January, but the improvement has a long way to go before normal conditions are reached. We quote store prices on steel bars around 1.80c., and on small structural shapes and plates 1.85c. to 1.90c. Railroad track material is in slightly better demand.

Old Material.—Considerable improvement is noted, but it is mostly of a speculative nature. Quotations have been advanced on several grades, but this action cannot be taken to mean that the consumption has increased in this vicinity. As a matter of fact the nearby rolling mills are not consuming anything like the usual tonnage of scrap. The minimum figures given below represent what buyers are willing to pay for delivery in their yards, southern Ohio and Cincinnati, and the maximum quotations are dealers' prices f.o.b. at yards:

Per Gross Ton	
Bundled sheet scrap	\$6.75 to \$7.25
Old iron rails	11.00 to 12.00
Relaying rails, 50 lb. and up.	19.75 to 20.25
Rerolling steel rails	9.75 to 10.25
Melting steel rails	9.00 to 9.50
Heavy melting steel scrap	9.00 to 9.50

Per Net Ton	
No. 1 railroad wrought	\$8.50 to \$9.00
Cast borings	4.50 to 5.00
Steel turnings	4.50 to 5.00
Railroad cast scrap	9.50 to 10.00
No. 1 machinery cast scrap	10.25 to 10.75
Burnt scrap	6.50 to 7.00
Old iron axles	14.00 to 14.50
Locomotive tires (smooth inside)	9.00 to 9.50
Pipes and flues	6.00 to 6.50
Malleable and steel scrap	7.00 to 7.50
Railroad tank and sheet scrap	5.00 to 5.50

Cleveland

CLEVELAND, OHIO, March 2, 1915.

Iron Ore.—It is not expected that Lake Superior ore prices will be established for several weeks. Some inquiry has come from consumers regarding prices, but sellers in reply have advised furnace companies that they will not quote prices at the present time, but will make reservations subject to the market price to be established later. So far there have been practically no reservations. We repeat 1914 prices as follows: Old range Bessemer, \$3.75; Mesaba Bessemer, \$3.50; old range non-Bessemer, \$3; Mesaba non-Bessemer, \$2.85.

Pig Iron.—The market in this territory shows little life, but one selling agency reports a better volume of inquiry from points west of Ohio, and in the week made sales of foundry iron in small lots aggregating about 2500 tons. Sellers are making no efforts to close last half contracts as they feel that buyers generally at the present time would be unwilling to pay an advance for that delivery. Some small sales of Southern iron are being made at \$9.50, Birmingham, for No. 2, and it is being offered at \$9.75 for the last half. Shipments on contracts are fairly good, the melt having improved. Business with the stove foundries, however, is still dull. We quote, delivered Cleveland, as follows:

Bessemer	\$14.55
Basic	13.45
Northern No. 2 foundry	13.50
Southern No. 2 foundry	13.50
Gray forge	13.00
Jackson Co. silvery, 8 per cent. silicon	16.62 to 17.12
Standard low phos. at furnace	19.75 to 20.00

Coke.—There is a limited demand for foundry coke for prompt shipment, but no inquiry for furnace grades. Prices of foundry coke range from \$2 to \$2.50 per net ton at oven. We quote standard Connells-ville furnace coke at \$1.50 to \$1.60 for prompt shipment.

Finished Iron and Steel.—While February business showed considerable improvement over January, the demand in finished lines at present is only moderate. The advance in price to 1.15c., Pittsburgh, on steel bars, plates and shapes March 1, brought out some business at the end of the month, but not so much as was expected. However, most consumers are covered with 1.10c. contracts through the first quarter. While the new price has not been tested, the steel companies affirm their intention to hold firmly to the advance, and some good business has been taken at the 1.15c. price. Ohio shops report an improved inquiry for tank work, and this is stimulating the plate market somewhat. Some inquiries are coming from Ohio sheet mills for sheet bars for the second quarter. Bids for the Clark avenue bridge in Cleveland, requiring 9400 tons of structural material, were opened today and brought out some very low prices for fabricated work. The low bid was made

by the King Bridge Company, Cleveland, this company's bid being \$51.90 a ton erected. Other bids were the McClintic-Marshall Company, \$54.60; American Bridge Company, \$55.90; and Strobel Steel Construction Company, \$62.20. Not much new inquiry is coming out for structural material. The Toledo Bridge & Crane Company has taken 240 tons for the Northern National Bank Building, Toledo, and there is an inquiry for 215 tons for the new Cleveland plant of the Elyria Iron & Steel Company. Mill prices on galvanized sheets have advanced to 3.50c. for No. 28, but lower prices are being quoted by some jobbers. Black sheets are firm at 1.80c. to 1.85c. for No. 28, and galvanized at 1.35c. for No. 10. The Algoma Steel Company has taken 500 tons of open-hearth rails for the Toledo Terminal Railway Company and 500 tons for the Northern Ohio Traction Company, naming prices about \$3 per ton lower than the American mills. The traction company is reported to have secured a price of \$29.40 delivered Akron. The bar-iron market is dull, but prices are firmer. Local mills are making a minimum quotation of 1.10c. for outside shipment and a Western mill is quoting bar iron at 1.08½c.

Cast-Iron Pipe.—The city of Cleveland will receive bids March 12 for 12,700 tons of 3-in. to 72-in., and 560 tons of castings for the waterworks department. Akron, Ohio, will take bids March 5 for 2500 tons.

Bolts, Nuts and Rivets.—The demand for bolts and nuts is more active and prices are apparently being firmly maintained, although some buyers are trying to secure concessions. Rivets are also in better demand. Rivet prices are 1.45c. to 1.50c., Pittsburgh, for structural and 1.55c. to 1.60c. for boiler. Bolt and nut discounts are as follows: Common carriage bolts, ¾ x 6 in., smaller or shorter, rolled thread, 80 and 20 per cent.; cut thread, 80 and 15 per cent.; larger or longer, 80 per cent.; machine bolts with h.p. nuts, ¾ x 4 in., smaller or shorter, rolled thread, 85 per cent.; cut thread, 80 and 20 per cent.; larger or longer, 80 and 5 per cent.; coach and lag screws, 85 and 5 per cent.; square h.p. nuts, blank or tapped, \$6.50 off; hexagon h.p. nuts, blank or tapped, \$7.40 off; c.p.c. and t. square nuts, blank or tapped, \$6.20 off; hexagon ½ in. and larger, \$7.50 and \$7.75 off; 9/16 in. and smaller, \$8 and \$8.25 off; semi-finished hexagon nuts, ½ in. and larger, 85, 10, 10 and 5 per cent.; 9/16 in. and smaller, 85, 10, 10 and 10 per cent.

Old Material.—The market was more active for several days, due largely to covering by dealers who had sold short to Valley mills and prices were stronger. Those who sold short now seem to be covered and conditions are quieter, prices easing off somewhat. Local mills have taken some heavy melting steel scrap at prices higher than have been prevailing recently. Sales have been made in Cleveland as high as \$11, but \$10.50 seems to more fairly represent the market. Sales have been made to Youngstown mills at \$7.75 for turnings and \$8.25 for borings. An unusually heavy railroad tonnage is being offered this month. Lists from the Pennsylvania Lines, both East and West, the New York Central, the Baltimore & Ohio and the Wheeling & Lake Erie, are to be closed this week. We quote, f.o.b. Cleveland, as follows:

Per Gross Ton	
Old steel rails, rerolling.....	\$11.00 to \$11.75
Old iron rails	12.00
Steel car axles	13.25 to 13.50
Heavy melting steel	10.00 to 10.50
Old carwheels	10.00 to 10.50
Relaying rails, 50 lb. and over.....	22.50
Agricultural malleable	8.00 to 8.50
Railroad malleable	10.25 to 10.50
Light bundled sheet scrap.....	8.00 to 8.50
Per Net Ton	
Iron car axles	\$16.00 to \$16.50
Cast borings	6.25 to 6.50
Iron and steel turnings and drillings	5.75 to 6.00
Steel axle turnings	6.25 to 6.50
No. 1 busheling new	8.75 to 9.00
No. 1 busheling old	8.50 to 8.75
No. 1 railroad wrought	9.50 to 10.00
No. 1 cast	10.00 to 10.50
Stove plate	8.00 to 8.50

The Tata hydroelectric enterprise, costing \$2,000,000, was put in operation February 8, the power being turned on by the governor of Bombay, India. The plant is managed by an American and its equipment is largely from this country.

Buffalo

BUFFALO, N. Y., March 2, 1915.

Pig Iron.—Small lots continue to be the rule in new buying although one order of between 2,000 and 3,000 tons of basic is reported and at a price better than \$13.50 at furnace. Shipments on contracts are quite heavy to radiator makers and considerable iron is also going to machinery makers. The stock of the Canadian Furnace Company at Port Colborne, Ont., will be blown in March 10 to fill orders recently received. We quote as follows, f.o.b. furnace for last half delivery:

No. 1 foundry.....	\$13.00 to \$13.25
No. 2 X foundry	12.75 to 13.00
No. 2 plain	12.50
No. 3 foundry	12.25 to 12.50
Gray forge	12.25 to 12.50
Malleable	12.75 to 13.00
Basic	13.50 to 13.75
Charcoal, regular grades and analysis.....	15.75 to 17.00

*The minimum applying only to direct shipments from furnace instead of from storage yards or docks at Buffalo.

Finished Iron and Steel.—Most of the selling agencies report orders on bars, plates and shapes in fairly good volume, owing to the stimulating effect of the advance in price effective March 1; with some orders coming in since that date at the new price of 1.15c. for March delivery. Prices for wire products are firm: Galvanized extras having been advanced \$2 per ton effective March 1, due to the increased cost of spelter. Black sheet prices have stiffened somewhat in sympathy with the advance in galvanized sheets. The Troy Gas Company, Troy N. Y., has let contract to the Great Lakes Dredge & Dock Company, Albany, for 250 ft. of steel docking. The Lackawanna Bridge Company has 1200 tons for the additional factory building for the Remington Arms Company, Ilion, N. Y. The New York Central Railroad has placed with an independent fabricator 650 tons of steel for an Erie Barge Canal bridge at Utica. Bids are being taken this week for 100 tons for the Tonawanda Power Company, Tonawanda, N. Y. The Erie Structural Steel Company, Erie, has taken 100 tons for the Security Trust & Savings Company, Erie.

Old Material.—Considerable activity developed the latter part of last week, with quite heavy buying from outside districts. The dealing was principally in turnings, borings, bundled sheet scrap and No. 1 and No. 2 busheling scrap. Prices for these commodities advanced 25c. to 50c. per ton. Sales of heavy melting steel made in the past week were for Pittsburgh and Valley districts, the principal local consumer still being out of the market. We quote dealers' asking prices, per gross ton, f.o.b. Buffalo, as follows:

Heavy melting steel.....	\$10.50 to \$10.75
Low phosphorus steel.....	12.50 to 13.00
No. 1 railroad wrought scrap.....	10.00 to 10.50
No. 1 railroad and machinery cast.....	10.50 to 11.00
Old steel axles	12.00 to 12.50
Old iron axles	16.00 to 16.50
Old carwheels	10.00 to 10.50
Railroad malleable	9.50 to 10.00
Machine shop turnings.....	5.75 to 6.25
Heavy axle turnings	8.50 to 9.00
Clean cast borings	6.50 to 7.00
Old iron rails	11.00 to 11.50
Locomotive grate bars	9.00 to 9.50
Stove plate (net ton)	8.25 to 8.75
Wrought pipe	6.50 to 7.00
Bundled sheet scrap	7.25 to 7.75
No. 1 busheling scrap.....	8.00 to 8.50
No. 2 busheling scrap.....	5.50 to 6.00
Bundled tin scrap	10.00

Birmingham

BIRMINGHAM, ALA., March 1, 1915.

Pig Iron.—Pipe interests are credited with having purchased a total of 15,000 to 20,000 tons from several makers and to be inquiring for more. Otherwise, the business of the week was confined to lots not above 500 tons. The price does not appear to have changed. It is a \$9.50 market for good quantities and \$9.75 for small lots, with \$10 and up secured for special analysis irons. It is believed that reports of foreign business have been inaccurate as to volume, although there is no doubt that Great Britain has recently purchased 10,000 tons and over. Some barbed wire left Gadsden during the week for Havre, France, and several car-

loads of steel billets were shipped to Liverpool via Mobile. When the steamship Carib sank off the German coast, several hundred tons of Birmingham pig iron destined for Germany went down with it. There is no doubt that there is a constant movement of Alabama metal products to Europe, but ship room is scarce and the trade is necessarily restricted for that reason. The fact remains that increasing effort of Europe to get Alabama metals means a large business when shipping becomes easier. The Southern foundry use of iron is increasing and the Southern situation is altogether better. The steel mills will continue to operate on a liberal scale in early March, with indications of like operations for some time. We quote, per gross ton, f.o.b. Birmingham district furnaces, as follows:

No. 1 foundry and soft.....	\$10.00 to \$10.25
No. 2 foundry and soft.....	9.50 to 9.75
No. 3 foundry	9.00 to 9.25
No. 4 foundry	8.75 to 9.00
Gray forge	8.50 to 8.75
Basic	9.50 to 10.00
Charcoal	22.50 to 23.00

Cast-Iron Pipe.—Manufacturers are looking forward to a good business in March and are buying iron ahead. The makers of gas and water pipe are operating on a large scale and the sanitary pipe shops will get busier with the starting in of spring building. The Lynchburg Pipe Company, of Anniston, resumes operations this week. We quote, per net ton, f.o.b. shops, as follows: 4-in., \$20; 6-in. and upward, \$18, with \$1 added for gas pipe.

Coal and Coke.—Current coal business is at a low ebb and prices are not satisfactory. Coke is well taken care of for the same reason that has existed for some time, namely, the small output. It is believed that some beehive plants now idle will never resume, on account of the increased use of by-product coke and the demand for the chemical by-products. We quote, per net ton, f.o.b. oven, as follows: Furnace coke, \$2.75 to \$2.90; foundry, \$3.20 to \$3.40, with \$3.75 for special brands.

Old Material.—While scrap has been sold in comparatively good quantities, the general demand is not reported as having improved. We quote, per gross ton, f.o.b. dealers' yards, as follows:

Old iron axles	\$13.00 to \$13.50
Old steel axles	12.50 to 13.00
Old iron rails	12.00 to 12.50
No. 1 railroad wrought.....	8.50 to 9.00
No. 2 railroad wrought.....	7.50 to 8.00
No. 1 country wrought.....	8.00 to 8.50
No. 2 country wrought.....	7.00 to 7.50
No. 1 machinery cast.....	9.50 to 10.00
No. 1 steel scrap	8.00 to 8.50
Tram carwheels	8.50 to 9.00
Stove plate	8.00 to 8.50

St. Louis

ST. LOUIS, Mo., March 1, 1915.

Pig Iron.—Demand for small lots continues, with sales for the week totaling 3000 to 3500 tons. Foundries confess requirements are being filled chiefly on the hand-to-mouth basis. Specifications on contracts indicate that the melt is growing.

Coke.—Two big inquiries are pending, about 40,000 tons for a beet sugar refinery and about 12,000 tons for an Omaha smelter, both taking furnace grade coke. These are being sharply competed for and the closing date is not likely to be in the near future. By-product coke is rather firmer.

Finished Iron and Steel.—There has been steady increase in demand by the fabricators, but no great disposition to make long time contracts. Plates are a little more active as a result of recent car orders. Bars are in only fair demand, with some increase in inquiry for reinforcing material. Bids are asked on 1600 tons of rails for local street railway use. Buying out of warehouse continues good as a result of the indisposition to contract very far ahead for material, and the prices quoted are well held. We quote for material out of warehouse stock as follows: Soft steel bars, 1.70c.; iron bars, 1.65c.; structural material, 1.80c.; tank plates, 1.80c.; No. 10 blue annealed sheets, 2c.; No. 28 black sheets, cold rolled, 2.55c.; No. 28 galvanized sheets, black sheet

gauge, 3.70c., the last named having been advanced because of the rise in spelter.

Old Material.—The scrap market has shown no further evidence of softening and prices are better held than in the past few weeks. Relaying rails are rather active because of the opening of the spring season and are hard to get. Mills and foundries are making no new contracts for future delivery. Railroads continue to offer large quantities of old material, but have not materially affected the market. We quote dealers' prices, f.o.b. St. Louis, as follows:

Per Gross Ton	
Old iron rails	\$10.50 to \$10.75
Old steel rails, re-rolling	10.25 to 10.50
Old steel rails, less than 3 feet.....	11.50 to 12.00
Relaying rails, standard section, subject to inspection	21.00 to 23.00
Old carwheels	10.25 to 10.50
No. 1 railroad heavy melting steel scrap	9.50 to 9.75
Shoveling steel	8.75 to 9.00
Frogs, switches and guards cut apart	9.75 to 10.00
Bundled sheet scrap	6.00 to 6.25

Per Net Ton	
Iron angle bars	\$10.75 to \$11.00
Steel angle bars	9.00 to 9.25
Iron car axles	15.00 to 15.50
Steel car axles	10.75 to 11.00
Wrought arch bars and transoms.....	11.25 to 11.50
No. 1 railroad wrought.....	8.25 to 8.50
No. 2 railroad wrought.....	8.00 to 8.25
Railroad springs	8.75 to 9.00
Steel couplers and knuckles.....	9.00 to 9.25
Locomotive tires, 42 in. and over, smooth inside	9.00 to 9.25
No. 1 dealers' forge	7.50 to 7.75
Mixed borings	5.25 to 5.50
No. 1 bushelings	7.75 to 8.00
No. 1 boilers, cut to sheets and rings.....	6.25 to 6.50
No. 1 railroad cast scrap.....	9.50 to 10.00
Stove plate and light cast scrap.....	8.00 to 8.25
Railroad malleable	7.25 to 7.50
Agricultural malleable	6.75 to 7.00
Pipes and flues	6.25 to 6.50
Railroad sheet and tank scrap.....	6.25 to 6.50
Railroad grate bars	7.50 to 7.75
Machine shop turnings	5.75 to 6.00

San Francisco

SAN FRANCISCO, CAL., February 23, 1915.

A strong buying movement in galvanized products has resulted from the rapid advance in prices. In other lines there is no real activity, though specifications are coming out a little more freely. Immediate consuming requirements, though still light, are gradually increasing, with fair prospects of a revival in large construction work in the spring.

Bars.—Continued dullness in building operations keeps the movement of reinforcing bars down to narrow limits. Soft steel bars are moving fairly well in certain quarters, but some large consuming industries are almost entirely out of the market and important orders are scarce. Stocks of foreign bars, with one or two exceptions, have been pretty well reduced, and as far as is known there is nothing more afloat. There is, accordingly, some disposition to cover near-by requirements, and specifications on old contracts show some increase, though stocks are not being built up in a large way.

Structural Material.—Figures have been sent in on the two large inquiries formerly mentioned, neither of which has yet been heard from. Locally, nothing of importance is definitely in the market, but plans are about ready for a 14-story office building in Oakland, and a 12-story building in the same city is expected to be out soon. Plans are also under way for several buildings for the University of California, on which a fair tonnage is expected.

Plates.—Some interest is taken in the announcement that the Union Iron Works has taken a contract for a 10,000-ton steamer for Hind, Rolph & Co., and will build a similar vessel for its own account. It is also rumored that this company is bidding on several other large steamers. Business in tank plates is spasmodic, being rather quiet at the moment, though some large consumers are specifying freely. Merchants' specifications also are rather more in evidence, but very little improvement is noted in the small trade.

Sheets.—Black and blue annealed sheets still receive little attention, but there has been quite a heavy

movement in galvanized, stocks of which are being augmented more largely than for a year or more. Mill agents are now holding firmly to the new price of 3.25c., Pittsburgh, and will take only a small tonnage at that figure. Most of the business consists of specifications on contracts placed at the former low prices. Some new orders were taken at 3c., but buying at the present price is limited. Small dealers and consuming trades are putting in considerable stock, though immediate needs are not heavy. Jobbers' resale prices have been marked up in keeping with the mill prices.

Wrought Pipe.—Oil country goods remain dull and quiet building operations retard local business. A large country trade is expected, but this also is retarded by wet weather. The stiffening of mill prices, however, has caused an appreciable increase in orders from merchants for galvanized pipe and to some extent for black. Stocks are being put in better shape than for several months, but buying is generally governed by conservative estimates of spring requirements.

Cast-Iron Pipe.—Small orders have been placed by the towns of Santa Barbara and Pasadena, Cal., and San Diego has ordered 327 tons. The United States Cast Iron Pipe & Foundry Company is low bidder on 4250 tons of pipe, 6 to 30 in., for Portland, Ore. This inquiry also includes 50 tons of specials. No other notable inquiries have appeared.

Pig Iron.—The market is still dragging. Local foundry operations have seldom been so dull as this winter, and, with the larger melters well supplied with stock received during the fall, importers' holdings are diminishing but slowly. The demand for domestic iron is negligible.

Coke.—The local yards are still carrying large stocks, which are moving slowly at about \$12.50 per net ton, most of the business being with small consumers. English coke, to arrive during the summer, is quoted at about \$11 to \$12 per gross ton.

Old Material.—Steel melting and wrought scrap continue quiet, the principal requirements being pretty well covered by contracts or former purchases. The demand for cast-iron scrap is limited to current needs, but foundries are buying in a small way, prices standing as before within the general range of \$14 to \$16 per net ton. The navy collier Caesar recently loaded a large accumulation of scrap metal from the Bremer-ton (Wash.) Navy Yard for Norfolk, Va.

New York

NEW YORK, March 3, 1915.

Pig Iron.—Few transactions of any magnitude are reported for the past week, but there is no indication that buyers are unwilling to contract for such amounts as they have reasonable expectation of using. The market is following the humdrum of the earlier weeks of the year, with little indication of a buying movement in the immediate future. Some iron for radiator work is included in that under inquiry. Export inquiries are still of considerable amount, but actual sales are small in comparison with the tonnages talked about. Hematite has been sold for export to England, the specification being nearer that for standard Bessemer, as to phosphorus, than to what is here classed as low-phosphorus iron. New England foundrymen are rather more cheerful, the business in machinery required for the manufacture of war munitions having at length made some impression on the melt of foundry iron. A sale of Southern iron to a Sound foundry which usually draws on Alabama for a part of its mixture is reported, and a number of New York State and New England foundries have taken moderate lots of Buffalo iron. Some irregularity has been noticed lately in quotations of Buffalo furnaces and \$13 for No. 2 X iron is not minimum. On Bessemer iron for export some recent sales from eastern Pennsylvania furnaces have been at free alongside prices figuring back to \$14.25 to \$14.50 at furnace. We quote as follows on Northern iron for tidewater delivery, revised freights being 74 cents from the Lehigh Valley,

95 cents from the Schuylkill Valley and \$2.10 from Buffalo, while from Buffalo to New England the new rate is \$2.58, as against \$2.45 before the advance; No. 1 foundry, \$14.50 to \$15; No. 2 X, \$14.25 to \$14.50; No. 2 plain, \$14 to \$14.25. We quote Southern iron at \$14.50 for No. 1 and \$14 to \$14.25 for No. 2.

Ferroalloys.—It is definitely learned that by an agreement between the British producers of ferromanganese and the British Government, it was decided to lift the embargo to the extent of permitting 5000 gross tons per month to come to this side. Dissensions as to the proper apportionment of this total among the British producers having contracts in this country at once arose and held up the arrangement. It is confidently believed here now that some understanding will be or perhaps has been effected. Some American representatives have no definite information from British producers as to shipments, while others state that they are assured that they will receive about 1000 tons per month as soon as the carriers can be secured. It is intimated that this supply is not likely to begin arriving here before April 1 and that, based on the allotment concerning which definite information has been received, the total to be available for this country under the arrangement will not prove to be much over 2500 tons per month. In any case 2500 or even 5000 tons per month is not a sufficient supply, our average monthly imports in 1913 amounting to over 10,000 gross tons and in 1914 to nearly 7000 tons. It is understood that any shipments if now made under the new understanding are to apply only to recent readjusted or "married" contracts—that is, a new amount at \$68, seaboard, joined with an equal tonnage of the old \$38 contract. The former nominal quotation of \$68, seaboard, is now withdrawn and no new contracts are possible, the British producers having virtually withdrawn from the market. Anxiety on the part of many consumers is growing, though some of the larger steel companies are regarded as being pretty well supplied. Small sales of spot metal are reported to be going at \$100 to \$125 per ton. Inquiry for export is still being made but no business closed. Spiegeleisen is active at \$26 to \$28 per ton at furnace, there being both domestic and foreign sales. Ferrosilicon, 50 per cent., continues to be quoted at \$71 to \$73, Pittsburgh.

Structural Material.—The market is still in anticipation of the considerable amount of work which is now under consideration in architects' offices and among builders. Much is expected of March by fabricators. Were it expedient to enumerate even a partial list of the larger building propositions yet to come up for steel figures, it would be quite reassuring. Meanwhile new business has not appeared in sufficient volume since the first of the month to test the 1.15c. Pittsburgh base. One of the interesting developments has been the competition for the 7500 tons of elevated railroad work for widening the Broadway line, Brooklyn. Lewis F. Shoemaker & Co. were low at \$37.20 a ton delivered, and next bidders were 20, 60 and 95c. a ton higher. Most of the work closed since the last report covers relatively small work including 200 tons for a brewery in Newark to the Charles Goeller Construction Company and 250 tons for a parochial school at Syracuse taken by A. B. Haley. The Passaic Steel Company has been awarded 800 tons for the Paterno apartment on Eighty-eighth street. Among new projects are four schools in Greater New York totaling about 1750 tons; 800 tons for an apartment house at 407 Park avenue; 350 tons for a building at 588 Fifth avenue; 1000 tons for a torpedo station at Newport, R. I.; 300 tons for structural work on Wards Island, and 200 tons for the National Lead Company in Long Island City. We quote mill shipments at 1.15c., Pittsburgh, or 1.319c., New York, and from store 1.85c. to 1.90c., New York.

Plates.—Business locally is dull but Eastern plate mills are running close to 60 per cent. capacity, showing the influence of the considerable amount of boat building on the Atlantic seaboard. Prices are weak with quotations of 1.10c., Pittsburgh, still being made. There is still no encouragement for plate mills in

railroad car work for there is as yet not more than 2500 cars of all descriptions before the market. Some of the structural work under consideration involves a considerable amount of plates, with 2700 tons in the Broadway Brooklyn elevated widening and strengthening project. In railroad cars against 1200 box cars and 300 stock cars placed by the Burlington with the Haskell & Barker Car Company, has come into the market 1200 steel freight cars and 200 general service cars for the Missouri, Kansas & Texas. The Burlington is still in the market for 200 gondola cars. The Southern has placed 500 box cars with its subsidiary, the Lenoir Car Company; the Kansas City Railway & Light Company has bought 50 cars from J. G. Brill Company and the Boston & Maine has placed 6 postal cars with the Laconia Car Company. The Siam Government is asking for 159 small cars of some 11 different types on which bids must be received not later than July 29. We quote steel plates at 1.10c. to 1.15c., Pittsburgh, or 1.269c. to 1.319c., New York, and from store 1.85c. to 1.90c., New York.

Steel and Iron Bars.—A drop in specifications is noted and as yet new inquiry has been light. Each mill appears to be quoting 1.15c., Pittsburgh, for shipment at mill's convenience, but is watching developments closely to learn of any weak spots in quotations. March is generally a light month in these products, and with considerable material under contract for the second quarter at 1.15c., the general opinion is that the present quotation will hold. It appears that February has barely held its own with January, even taking account of the less number of business days. One maker of bar iron and bar iron products reports February as being better than every month of 1914 with one exception. We quote mill shipments of steel bars at 1.15c., Pittsburgh, or 1.319c., New York. Out of store in New York we quote iron and steel bars at 1.80c. to 1.85c.

Cast-Iron Pipe.—The Department of Water, Gas and Electricity of the city of New York will open bids for 6, 8 and 12 in. for the boroughs of Queens and the Bronx, March 8, totaling about 1100 tons. No other municipal lettings of consequence are in sight in this immediate territory. The demand from private buyers is considerably less than a few weeks ago, but is about normal for the season. Some of the pipe companies are now so well fortified with orders that they are asking more for their product, but enough others are anxious for business to keep prices generally from advancing. Carload lots of 6-in. continue to be quoted at \$20 to \$20.50 per net ton, tidewater.

Old Material.—Conditions in eastern Pennsylvania are somewhat better, as fairly heavy buying of heavy melting steel scrap is likely to occur shortly as the result of inquiries now in the market. Rolling mill stock is in slightly greater request and cast scrap is looking up, with pipe foundries among the largest buyers. Quotations are about 25c. per ton higher on quite a number of commodities. Dealers' quotations per gross ton, New York, are as follows:

Old girder and T rails for melting....	\$8.25 to \$8.50
Heavy melting steel scrap.....	8.25 to 8.50
Relaying rails	19.00 to 19.50
Re-rolling rails (nominal).....	8.50 to 8.75
Iron car axles.....	15.25 to 15.75
Steel car axles.....	11.50 to 12.00
No. 1 railroad wrought.....	10.00 to 10.50
Wrought-iron track scrap.....	9.25 to 9.75
No. 1 yard wrought, long.....	9.25 to 9.75
No. 1 yard wrought, short.....	8.50 to 8.75
Light iron	3.50 to 4.00
Cast borings	5.75 to 6.25
Wrought turnings	6.00 to 6.25
Wrought pipe	7.75 to 8.25
Carwheels	9.50 to 9.75
No. 1 heavy cast, broken up.....	10.50 to 11.00
Stove plate	8.00 to 8.25
Locomotive grate bars.....	7.00 to 7.50
Malleable cast	7.00 to 7.50

The American Steel & Wire Company announces the following advances in extras for galvanizing plain low carbon steel wire: On Nos. 14 and coarser, from \$0.40 to \$0.50 per 100 lb.; Nos. 15 and 16, from \$0.70 to \$0.80; Nos. 17 and 18, from \$1.10 to \$1.20.

Boston

BOSTON, MASS., March 2, 1915.

Old Material.—The market is somewhat stronger, because of buying by New England mills, notably those of the American Steel & Wire Company at Worcester, and because of the improvement noted in other districts. Prices here have not responded fully to the changes elsewhere, but it is expected that they will do so shortly. The quotations given below are based on prices offered by the large dealers to the producers and to the small dealers and collectors, per gross ton, carload lots, f.o.b. Boston and other New England points which take Boston rates from eastern Pennsylvania points. Mill prices are approximately 50c. per ton higher.

Heavy melting steel.....	\$8.25 to \$8.50
Low phosphorus steel	13.75 to 14.75
Old steel axles	12.75 to 13.25
Old iron axles	20.25 to 20.75
Mixed shafting	12.00 to 12.25
No. 1 steel wrought and soft steel...	8.25 to 8.75
Skeleton (bundled)	5.50 to 5.75
Wrought-iron pipe	7.00 to 7.50
Cotton ties (bundled)	5.25 to 5.75
No. 2 light	3.25 to 3.75
Wrought turnings	5.00 to 5.50
Cast borings	5.00 to 5.25
Malleable	7.50 to 7.75
Stove plate	7.00 to 7.50
Grate bars	5.25 to 5.50
Machinery cast (price to consumers) ..	11.25 to 11.50

Ferromanganese Shipments

British Government to Issue Permits — Some Sales of American Steel

(By Cable)

LONDON, ENGLAND, March 3, 1915.

It is considered probable that export permits will be issued in a few days for ferromanganese for the United States. The position of pig iron is unchanged and trade is slow. Japan is buying a little foundry iron. Costs are excessive and labor everywhere is fractious. Furnaces in blast at the close of February number 166, as against 169 one year ago. Stocks of pig iron in Connal's stores are 125,693 tons, against 122,858 tons one week ago.

American semi-finished steel has been sold at 120 shillings (\$29.20), c.i.f. Liverpool, but not much has been done.

Bolckow, Vaughan & Co. have booked 12,500 tons of rails for Australia at £7 (\$34.06), f.o.b. The Government is arranging freight by transports. It is reported that the United States Steel Corporation has booked 30,000 tons of rails for France, but this cannot be confirmed here. Tin plates are firm. Japan bought 50,000 boxes of quarters at 15s. 3d. (\$3.71). We quote as follows:

Tin plates, coke 14 x 20, 112 sheets, 108 lb., f.o.b. Wales, 15s. (\$3.65).

Cleveland pig iron warrants, 56s. 6d. (\$13.75), against 56s. (\$13.63) last week.

No. 3 Cleveland pig iron, makers' price, f.o.b. Middlebrough, 56s. 9½d. (\$13.82), against 56s. 9d. (\$13.81) last week.

Steel black sheets, No. 28, export, f.o.b. Liverpool, £10 5s. (\$49.88).

Steel ship plates, Scotch, delivered local yards, £8 10s. (\$41.36).

Steel rails, export, f.o.b. works port, £7 2s. 6d. (\$34.67).

Hematite pig iron, f.o.b. Tees, 90s. (\$21.89), against 92s. 6d. (\$22.51) last week.

Sheet bars (Welsh), delivered at works in Swansea Valley, £6 10s. (\$31.63).

Steel joists, 15 in., export, f.o.b. Hull or Grimsby, £8 5s. (\$40.15), against £8 (\$38.93) last week.

Steel bars, export, f.o.b. Clyde, £8 10s. (\$41.36) against £8 5s. (\$40.14) a week ago.

Ore Position Again Tightening—American Steel Cheaper—Labor Restive

(By Mail)

LONDON, ENGLAND, February 10, 1915.—The pig-iron trade is quiet, but the tone is necessarily firm. The export trade is, of course, very seriously hampered by the restrictions in force, and at the same time there is not much domestic business. In speculation the tendency is dull, and it is not of much use to anticipate any radical alteration in this regard till the entire trade and political position undergoes a transformation. The stocks meantime are very small, but the tendency toward an increase, both as regards the public and private warehouses, is unmistakable. The shipments from the Tees district this year have been exceedingly small, but the position is not viewed with much anxiety from this angle, as output is very limited. It is interesting to record here, however, that Southern iron is to be had on f.o.b. terms if any needy consumers in Europe care to take the risk of shipping the material and can pay the freight demanded. On c.i.f. conditions, however, pig iron from America is not to be had at the moment, but even this may come, especially if freights drop to a more reasonable level. There is very little doing in hematite, but the tendency seems to be firmer.

IRON-ORE POSITION AGAIN DIFFICULT

The iron-ore situation is now one of growing difficulty again. In response to the exceedingly onerous situation created by the wholesale Government chartering of vessels, and to the representations of hematite makers that it would be impossible to meet the demands of the Sheffield steel masters unless some assistance was given to the commercial community, the Admiralty agreed that vessels on Government charter returning from France in ballast should be allowed to proceed to Bilbao to load up iron ore for ship's account. This, however, has done very little to ease the position, for it is reckoned that if the boats proceeded in ballast it was worth about 14s. (\$3.41) a ton to the shipowner, and this without risks of any kind apart from those incidental to navigation, while to recompense himself for the loss of the Government rate an ore freight of something like 16s. (\$3.89) at least would have to be obtained. The position is thus very little relieved by the Admiralty action. The truth is that all business is at sixes and sevens just now, naval and military considerations rightly overpowering all individual interests. However, the Government has now chartered one of the interned German steamers lying at Gibraltar to take ore from Carthage to the Tees at 15s. 6d. (\$3.77).

AMERICANS SELLING MORE FREELY

The Americans are much more liberal sellers of steel, the ball being opened by some of the outside plants which are manifestly hard up for orders. Within the last day or two sheet bars and billets have been done at advanced prices, and today about 120s. (\$29.20) a ton c.i.f., Liverpool, was paid. One American interest has offered sheet bars at 126s. 6d. (\$30.78) c.i.f. Newport, but this is not regarded as a very attractive price, though the position is so peculiar that anything might happen. Finished steel is quiet and firm. Coal is up to a fancy figure, and is almost bound to go higher, while labor is restive and practically only the "wasters" are left in the country, the better men having joined the army.

LABOR CONDITIONS AND STRIKES

Per capita outputs in all branches of industry are woefully reduced, and this is a by no means unimportant consideration to bear in mind when the productive capacity of the works at present running is taken into consideration. The men are very hard to live with just now. At shipyards engaged upon most urgent Government work, and where things are all behind, some non-union labor was recently taken on, to assist the building programme for national defense, but a strike was called immediately and the non-unionists had to be cleared out. The engineers at Elswick works have now given notice to strike next Wednesday unless the

non-union labor taken on to help the country's defense programme is withdrawn, and the Clyde engineers at a mass meeting unanimously decided to hold out for 2d. (4c.) per hour advance. Notwithstanding the Elswick trouble, the northeast coast engineering employers, in conference with engineering trades representatives have offered a very substantial increase in wages to all engineering shop workmen, skilled and unskilled alike. It is a flat rate advance to all trades of 4s. (97c.) a week on time rates and 10 per cent. on piece prices, to continue in operation until the end of June, 1916, when the present wage agreement expires. The advance is subject to acceptance by the general body of the men.

All over the country the rise in the cost of living caused partly by the unwillingness of the men to do a fair day's work for a fair day's pay is leading to trouble.

Metal Market

NEW YORK, March 3, 1915.

The Week's Prices

Cents Per Pound for Early Delivery							
Copper, New York		Electro-lytic New York		Lead New York		Spelter New York	
Feb.	Lake	Feb.	Lake	Feb.	Lake	Feb.	Lake
24.....	15.25	14.62½	37.75	3.85	3.80	9.75	9.60
25.....	15.25	14.62½	38.00	3.85	3.80	10.00	9.85
26.....	15.25	14.62½	38.85	3.85	3.80	10.15	10.00
27.....	15.25	14.62½	.....	3.85	3.80	10.25	10.10
Mar.							
1.....	15.25	14.62½	40.37½	3.90	3.85	10.35	10.20
2.....	15.25	14.62½	40.75	3.90	3.85	10.50	10.35

The heavy consumption of Lake copper is sustained and the situation is unchanged generally. Tin has been more active and prices are higher. Lead was advanced five points on March 1. Continued scarcity of spelter is still sending quotations upward. English brands of antimony are difficult to find and their nominal quotations are higher.

New York

Copper.—The situation is practically unchanged. The large consumption of Lake for war purposes is unabated, while the domestic consumption of electrolytic is anything but satisfactory. The quotation for prime Lake ranges from 15c. to 15.37½c., cash, New York, while less desirable brands are quoted at from 14.75c. to 15c. Electrolytic can be had at 14.62½c., cash, New York, or 14.75c., cash 30 days, delivered. For some reason not altogether clear to the trade one large interest on March 26 advanced its quotation to 15c. full terms, but this particular seller seemed to be alone at this price. In trying to explain this advance it has been suggested that perhaps the seller was trying to establish a basis on which England should pay for the metal she had seized. Exports were surprising in February because of their having dropped below the average of recent months. They totaled 14,778 tons, against 26,193 tons in January and 22,166 in December, and as a matter of fact were the smallest since the war started. The total so far this month is 560 tons. An excellent foreign demand for locomotive firebox plates continues and there are in the market inquiries for copper bolts and other products for export.

Copper Averages.—The average price of Lake copper for the month of February, based on daily quotations in *The Iron Age*, was 15.21c. and of electrolytic, 14.68c.

Tin.—There have been periods of activity and the trend of prices has been upward. The quotation yesterday was 40.75c., New York. On February 24 the market was reasonably active in spot and sales were made at 37.75c. with a few 5-ton lots at 37.87½c. The sellers replaced the metal they sold with nearby deliveries. The following day the market was dull but more interest was shown in futures. February 26 the demand for spot was better, but sellers were few; nevertheless, some sales were made at 38.75c. to 39c. February 27 there was a small business in futures. Activity was excellent February 29, between 300 and 400 tons of mixed deliveries changing hands. Spot was sold at 40.25c. to 40.50c. A feature of this day was the variance in the prices of future deliveries, prices of the same position being at times 1c. apart. Yesterday the

market was dull but strong and some sellers were unwilling to quote on the ground that they were holding metal for delivery against old contracts. There have been offerings of Banca tin at low prices, as compared with those of Straits. At times the difference amounted to 2½c. and some good sales were made. There is 1927 tons of Banca and Billiton tin afloat which is taken as an indication that the Dutch Government is anxious to sell. Deliveries in February were good, amounting to 3375 tons, of which 475 tons came from Pacific ports. In stock and landing February 27 was 2046 tons. Shipments from the Straits in February were 941 tons less than in the same month last year, and the decrease for two months of this year amounts to 976 tons.

Lead.—A strong undertone which prevailed in the market last week and which was based upon the strength in London culminated in an advance of \$1 per ton on March 1, making the New York price 3.90c. The St. Louis quotation is 3.85c. Exports have been good but domestic business has been light. The advance was fully expected and the only surprise was that it was not \$2 per ton. Exports in February totaled 1009 tons.

Spelter.—Under the scarcity and continued heavy demand for high grade spelter, suitable for cartridge metal, the New York price has advanced to 10.50c. to 10.75c., and that at St. Louis to 10.35c. to 10.50c. Brass mill special is quoted at 12c. and 13c., though these prices are nominal, and some very choice grades, like Bertha and Horsehead, at 16c. In view of the scarcity the market is less active. Exports in February totaled 5444 tons.

Antimony.—English brands are practically out of the market but Chinese can be had without very much difficulty. Cookson's is nominal at 23c. and Hallett's at 22c. Chinese can be had at 18.50c., duty paid.

Old Metals.—The demand from consumers has fallen off to some extent. Dealers' selling prices are unchanged as follows:

	Cents per lb.
Copper, heavy and crucible.....	13.25 to 13.75
Copper, heavy and wire.....	13.00 to 13.50
Copper, light and bottoms.....	12.00 to 12.50
Brass, heavy.....	9.00 to 9.25
Brass, light.....	7.50 to 7.75
Heavy machine composition.....	11.25 to 11.75
Clean brass turnings.....	9.25 to 9.50
Composition turnings.....	9.75 to 10.00
Lead, heavy.....	3.50
Lead, tea.....	3.25
Zinc, scrap.....	7.00

Chicago

MARCH 1.—The difficulty of securing spelter for immediate shipment at any price makes reliable quotations impossible, while futures are speculative in the extreme. Tin, lead and zinc all show an upward movement in prices and, with the exception of copper, the entire market is on a higher level. We have revised our prices and quote as follows: Casting copper, 14.50c.; Lake copper, 14.75c., for prompt shipment; small lots, ¼c. to ½c. higher; pig tin, carloads, 41c.; small lots, 43c.; lead, desilverized, 3.85c., and corroding, 4.10c., for 50-ton lots; in carloads, 2½c. per 100 lb. higher; spelter, spot quotations, nominal; sheet zinc, 12.50c.; Cookson's antimony, 22c. to 25c., for cask lots; other grades, 20c. On old metals we quote buying prices for less than carload lots as follows: Copper wire, crucible shapes, 11.75c.; copper bottoms, 10.25c.; copper clips, 11.50c.; red brass, 10.25c.; yellow brass, 8.25c.; lead pipe, 3.25c.; zinc, 6.50c.; pewter, No. 1, 23c.; tin-foil, 30c.; block tin pipe, 33c.

St. Louis

MARCH 1.—The non-ferrous metals in this market have continued an upward course the past week with apparently nothing to interfere. As a result all prices are higher and producers aver that the end is not yet. Lead is quotable today at 3.80c.; spelter, 10¼c. to 10½c., and no assurance of obtaining any at these prices; tin, 42c.; Cookson's antimony, 25c.; Lake copper, 15¼c.; electrolytic copper, 15.15c. In the Joplin ore market prices continued to rise to unheard of figures, with the result that the district is on a boom that is tending to a heavy increase in development and output to meet the appar-

ent shortage resulting from the disappearance from the market of the supplies of spelter which have hitherto been available from foreign sources. The range of prices was from \$63 to \$76 per ton on 60 per cent. ore, with the best settlement on choicest ores as high as \$79. Calamine stood firm at about \$40 for 40 per cent. with the top settlement running as high as \$50. Lead ore was firm at \$47. Miscellaneous scrap metals are quoted as follows: Light brass, 6.50c.; heavy yellow brass, 8.50c.; heavy red brass and light copper, 9.50c.; heavy copper and copper wire, 10.50c.; pewter, 22c.; tin-foil, 27c.; zinc, 3.50c.; lead, 3.50c.; tea lead, 3.50c.

Iron and Industrial Stocks

NEW YORK, March 3, 1915.

General conditions have shown such improvement and the pressure for the sale of securities on foreign account has so abated that values of securities have materially advanced on the New York Stock Exchange. The appreciation in values has extended to all classes of stocks. The range of prices on iron and industrial stocks from Wednesday of last week to Tuesday of this week has been as follows:

Am. Can, com....	25 - 27	Int. Harv. Corp., com.....	55 - 56
Am. Can, pref....	92 - 93	Int. Pump, pref.....	7 ½
Am. Car & Fdy., com.....	40 - 42 ½	Nat. En. & St., com....	10
Am. Car & Fdy., pref.....	112 ½-112 ½	Pressed St'l, com. 27 -	28
Am. Loco., com....	19 - 21 ½	Pressed St'l, pref. 90 -	92
Am. Loco., pref.....	78	Republic, com. ... 19 -	20
Am. Steel Fdries.....	26	Republic, pref....	73 - 76 ½
Bald. Loco., com. 28 -	30 ½	Rumely Co., com. ... ½ -	1
Bald. Loco., pref. 97 -	100	Rumely Co., pref. 3 -	3 ½
Beth. Steel, com. 53 ½ -	55 ½	Pipe, com.....	9 ½
Beth. Steel, pref.....	103 ½	Pipe, pref.....	32 ½
Case (J.I.), pref.....	77	U. S. Steel, com. 40 ¼ -	43 ¼
Colorado Fuel .. 23 -	23 ½	U. S. Steel, pref. 103 ½ -	104 ½
General Electric.....	139 - 139 ½	West'gh'se Elec. 64 -	68
Gt. No. Ore Cert. 28 ½ -	31 ½	Chic. Pneu. Tool. 46 ¼ -	47
Int. Harv. of N. J., com.....	92	Cambria Steel... 41 -	43
Int. Harv. of N. J., pref.....	113	Warwick.....	9 ½ - 9 ½
		Cruc. Steel, com. 13 ½ -	13 ½
		Harb.-Wk. Ref., com. 48	
		Cruc. Steel, pref.....	76 ½

Dividends

The La Belle Iron Works, quarterly, 1 per cent. on the preferred stock, payable March 31. This is the same rate as for the previous quarter.

The Railway Steel Spring Company, regular quarterly, 1½ per cent. on the preferred stock, payable March 20.

The Continental Can Company, regular quarterly, 1½ per cent. on the preferred stock, payable April 1. Deere & Co., regular quarterly, 1½ per cent., on the preferred stock, payable March 1.

The Pettibone-Mulliken Company, regular quarterly, 1½ per cent. on the preferred stock, payable April 1.

The Underwood Typewriter Company, regular quarterly, 1 per cent. on the common and 1½ per cent. on the preferred stock, both payable April 1.

The Cambria Iron Company, regular semi-annual, 2 per cent., payable April 1.

The Canadian-Westinghouse Company, Ltd., quarterly, 1 per cent., payable April 1. This places the stock on a 4 per cent. annual basis for the time being, against 7 per cent. in 1914.

Continued Large Spelter Exports

January exports of spelter from the United States were officially 30,807,854 lb., as against 36,632,727 lb. in December, 1914. This is the third greatest month since the war, the other besides December being September, 1914, with 38,090,144 lb.

Correction.—The W. F. & John Barnes Company, Rockford, Ill., states that the paragraph in which its name was mentioned on page 484 of *The Iron Age* of February 25, made an incorrect statement. The company has not placed an exclusive agency with any machinery dealer in Russia up to the present writing, and hence its name was erroneously included in the information given regarding agencies in this country taken by M. Mett & Co., Petrograd, Russia.

Work-Day Shortened and Output Maintained

Changing from 10 Hr. to 8 Hr. in
Forge Shop of Cleveland Hardware
Company—Meeting the Fatigue Factor

The subject of hours of labor in relation to the general efficiency and production in a drop forge plant has been given considerable attention in the past two or three years by the Cleveland Hardware Company, Cleveland, Ohio. Information gained by having men work 8 to 10 and 12 hr. a day and comparing the results of the longer and shorter hours of labor have convinced that company that the most satisfactory results are obtained by limiting the men to an 8-hr. day. The usual practice in drop forge shops is to have two shifts of men employed on the forging hammers, each shift working 60 hr. per week. The day men work 10 hr. per day six days per week and the night shift is on 12 hr. five days a week. This schedule of hours with a day and night shift was in force in the company's plant until two years ago, and the day men were allowed to work over-time 2 hr. per day, thus keeping the forge shop in continuous operation 24 hr. a day.

Orders were issued January 1, 1913, that no over work was thereafter to be permitted on a 10-hr. turn, or, in other words, no employee in the plant should work over 60 hr. per week. In that year, with practically the same men and equipment, the output of the plant was the largest in its history, and the general results of the shorter working day were regarded as so satisfactory that the company decided to further reduce a day's work to 8 hr., and this was gradually done in the various departments in 1914, until now all the employees are on the 8-hr. day with the exception of those in some of the repair departments. This means that over 75 per cent. of the working force in the company's shops is now on the 8-hr. basis. With the exception of the repair men, the change has affected all departments excepting the rolling mill men, who for several years have worked three 8-hr. shifts.

INSTANCES OF INCREASED PRODUCTION

Practically all the shop employees, with the exception of the die makers, are on piece work, and piece work prices were not changed with the shortening of the working hours. Generally the employees are said to be doing as much work in 8 hr., both in the forge shop and in the press room, as they did when working 10 hr. a day, and consequently are earning as much pay per day. As an example of speeding up under the shorter hours, the shop records show that the maximum production in the forge shop on a certain automobile forging was 195 pieces in a 10-hr. day, the average being about 175 pieces per day. Working on an 8-hr. basis this production has been increased to a maximum of 254 or an average of 240 per day without change in the forging work or the introduction of any other element that would tend to increase the output, the increased production being due solely to the speeding up on the part of the men.

While in the case of this one forging it was admitted that the showing is abnormal, it is stated that the general results indicate that throughout the forge shop and other departments on piece work, each employee is doing as much in 8 hr. as he formerly did in 10 hr. When the hours of the die makers were reduced from 10 hr. to 8 hr. per day, wages were left unchanged, so that they are paid the same

for an 8-hr. day as they formerly received for working 10 hr., and they are doing about the same amount of work now as they formerly did under the 10-hr. schedule.

TIME NOW FOR SUFFICIENT RECUPERATION

The general results of the inauguration of an 8-hr. day indicate that the same number of men are producing in 8 hr. what they formerly did in 10 hr. This means they have added 25 per cent. to their efficiency by doing 25 per cent. more work in a given time. This increased production in the case of the piece work men might be attributed wholly or in part to the fact that an employee working on a shorter schedule is spurred to his best efforts to earn as much in 8 hr. as he formerly did in 10 hr. This factor, however, is given little or no consideration by the plant managers. In their opinion the men are working faster under the shorter schedule because ample time is given them to recuperate. Work in the heat of a forge shop is particularly arduous and the company does not believe that with a 10-hr. day the men have sufficient time to recover from the fatigue of one day's work before they start on the next day's work. Now they have 16 hr. for recuperation.

ELIMINATION OF NIGHT WORK

One very evident advantage of the shorter working day is that workmen can be placed on schedules that tend more to their comfort than were they working longer hours. The forge shop men are employed in two shifts, the first shift from 6:30 a.m. to 2:30 p.m. Men on the first shift have a good part of the afternoon and all the evening for rest and recreation, those on the second shift have the forenoon and a portion of the afternoon, and men on both shifts not only have an abundance of time to spend at home with their families, but have an opportunity for a full night's sleep in regular sleeping hours, and consequently are more contented with their lot than they would be, were the hours less satisfactorily arranged. With the two shifts noted above, the disadvantages of an all-night shift are eliminated. In case of an unusual rush of work an extra night shift can be put on without disarranging the present schedule; this night shift working during the time the plant is normally shut down, that is, from 10:30 p.m. to 6:30 a.m.

As indicated by the 8-hr. schedule, no lunch time is provided for. It was found that the forge shop men usually got hungry and ate their lunch while at work before the time came for shutting down for lunch. The half hour for lunch was omitted in the new schedule without objection on the part of the men.

When forge men worked 2 hr. overtime on a 10-hr. day, a half hour of the time was given them for lunch; considerable of the time was taken up in the wash rooms and being tired out from their regular 10 hr. of work, the production in the last 2 hr. was found to be equal to only about the production during 1 hr. earlier in the day. Another objection to working men--overtime was that there was not enough overtime work for all the men in each gang

and a foreman's pay went on with a largely reduced force.

The adoption of shorter hours of working for the die makers proved particularly desirable to the company, as it did not have machine shop room or equipment adequate to do the work on single turn, and it was desired to avoid the disadvantages of the night shift. The two 8-hour shifts allow a doubling of the work in the die-making department without increasing the machinery equipment and at the same time an all-night shift is eliminated.

CANADA'S NEW TARIFF

Duties Advanced on Numerous Commodities— United States Products Affected

TORONTO, March 1, 1915.—The significance of the changes which have been made in the Canadian customs tariff does not lie so much in the percentages of the increase as in their widespread character. The increase under the preferential tariff is 5 per cent.; under the intermediate and general 7½ per cent. It is under the general tariff, of course, that merchandise from the United States is imported. How numerous the changes are may be gathered from the fact that only 114 items, out of a total of nearly 1100, have been allowed to remain untouched. Manufacturers who import iron, steel and other materials to be turned into finished products for export will still, however, be entitled to the 99 per cent. drawback.

Canada's imports of merchandise last year were valued at \$635,511,492. Of this amount \$425,324,576 was dutiable and \$210,186,916 free. It is estimated that under the new tariff only about \$50,000,000 worth of imports will be unaffected by the increased rates of duty. The importance of the changes to the American exporter may be gathered from the fact that of Canada's total imports of merchandise in 1914 over 66 per cent. came from the United States. The actual figures were \$410,585,249, of which \$262,999,229 were dutiable and \$147,582,020 free goods. According to the figures issued at Washington, Canada, next to Great Britain, buys more United States products than any other country.

The amount of duty collected by Canada last year on imports from the United States was \$61,895,168, compared with \$25,816,854 on imports from Great Britain. On the other hand, however, the average ad valorem rate on total imports—dutiable and free—was only 15.648 per cent. on American and 19.547 per cent. on British goods, and that notwithstanding the British preferential tariff. As under the new tariff the difference between the preferential and the general rates of duty will be 2½ per cent. larger than under the old order, the effect upon the average ad valorem rate will be awaited with interest.

Of Canada's imports from the United States, that which bulks largest is that coming under the broad classification of "iron and steel and manufactures of." This includes nearly everything in which iron and steel are the basis. Under this classification the imports last year were \$98,598,892, which, owing to the trade depression, was \$22,341,223 less than in 1913. Including minerals and their manufactures the total in 1914 reached \$121,191,639.

How imports of "iron and steel and manufactures of" from the United States predominate in the Canadian market may be gathered by a comparison of imports under the same classification from Great Britain and Germany, who rank next in order. From the former country the imports last year were \$15,528,381 and from the latter \$2,824,900. The imports from Germany were the largest on record. From a glance at these figures it will be seen that Canada imported \$80,245,611 more iron and steel products from the United States than from Great Britain and Germany combined.

Electric apparatus of all kinds were imported from the United States to the value of \$7,511,822. From

Great Britain and Germany the figures were \$964,769 and \$204,388 respectively. Of machinery, engines, boilers, electric motors, dynamos, generators, etc., \$32,117,000 worth came from the United States. This was nearly 83 per cent. of Canada's total imports from all countries. The following table shows the principal imports from the United States:

Agricultural machinery	\$3,199,131
Portable engines	2,320,699
Mining, smelting and reducing machinery ..	1,166,760
Ore and rock crushers, rock drills, etc.	482,427
Paper and pulp machines	423,707
Printing, bookbinding and lithographing machinery	1,325,675
Sewing machines and parts	452,158
Threshing machines, separators and parts ..	1,390,199
Electric motors, generators and dynamos ..	1,542,088
Gasoline and gas engines	2,581,699
Locomotives	661,288
Steam engines	394,574
Steam pumps	304,495
Steam boilers and parts	545,265
Other boilers not specified	325,702
Sawmill machinery	229,262
Rolling-mill machinery	175,721
Steam and electric shovels	576,402
Traction ditching machines	61,655
Carding, spinning and knitting machines ..	1,187,863
Cement making machines	181,907
Coal handling machinery	114,388
Cranes and derrick	791,187
Cordage, twine and linen manufacturing machines	33,339
Concrete mixing machines	167,364
Fire extinguishing machines	114,416

On binders and mowers the duty remains unchanged at 15 per cent., and printing presses, typesetting and typesetting machines and traction ditching machines are retained on the free list. With the exception of binder twine, barb wire, and plain galvanized wire (Nos. 9, 12 and 13), all of which are retained on the free list, the duty has been increased by 5 to 7½ per cent. on practically everything handled by the regular hardware man. Under this designation the principal imports from the United States are: Bar iron, \$3,093,957; butts and hinges, \$136,000; chains, \$499,000; cutlery, \$1,193,711; guns, rifles, revolvers, etc., \$611,624; builders' hardware, \$704,693; locks, \$436,500; nuts, bolts, T and strap hinges, \$258,953; cast-iron pipe, \$570,815; wood screws, \$79,000; Canada, Russian, and terne plates, \$486,254; flat galvanized sheets, \$1,018,536; stoves of all kinds, \$824,561; mechanics' hand tools, \$1,088,616; granite and hollow-ware, \$361,031; barb fencing wire, \$503,201; galvanized wire, Nos. 9, 12 and 13, \$1,219,510; wire cloth, \$129,351; wire rope for clothes lines, etc., \$111,563; tinware, \$529,000; aluminum goods, \$111,038; lamps and lanterns, \$876,000; nickel-plated ware, \$1,429,617.

While the avowed object of the increase in the customs tariff is the production of more revenue in order to meet increased expenditure on account of the war, yet incidentally it affords additional protection to Canadian industries. It is thus viewed by the manufacturers of Canada, and particularly those engaged in the production of iron and steel. The Liberal party in the House of Commons and the newspapers that represent its line of thought declare that the higher duties will not create the desired additional revenue, and, consequently, their intent is higher protection. Farmers' organizations are taking much the same stand. The new rates are, however, already in force. There may be some slight modifications before the budget is finally disposed of. Otherwise the new tariff will go through as it stands. The Government's majority is quite strong enough to see to that. What effect the new tariff will have on imports from the United States can only be conjectured. In all probability it will not be marked.

W. L. E.

The United States Geological Survey has issued "Mineral Resources of the United States" for 1913. As previously, this work is given in two volumes, Part I covering metals and Part II non-metals. Both are cloth bound, Part I having 901 pages and Part II 1617 pages of printed matter. These two volumes form a rich compendium of information on the production in the United States of all classes of minerals, the sections of the country from which they are derived, the uses to which they are applied and much other data relative to prices and competing imports.

The Manufacture of Ferromanganese

The Blast and Electric Furnace Processes Described and Compared—Yields and Losses in Each

Ferromanganese is used more than any other alloy in the manufacture of steel. The war has intensified its importance and more recent events have increased the possibilities of a lack of supplies in this country; so much so that active investigations are on foot to increase our domestic production, about 50 per cent. of the quantity consumed in the United States being imported. The following extract from bulletin 77, "The Electric Furnace in Metallurgical Work," of the Bureau of Mines, dealing with the history and manufacture of ferromanganese and written by Robert M. Keeney, is of unusual and timely interest:

HISTORICAL FACTS

The industrial importance of ferromanganese began in 1866 with the introduction of the Bessemer process, which required a strong deoxidizing agent to produce a sound steel. In 1866, Prieger, of Bonn, Germany, made in the crucible some ferromanganese containing 70 to 80 per cent. manganese. At Terre-Noire, France, a little later it was made in the open-hearth furnace and crucible in a combination process. The first ferromanganese to be made in the blast furnace was produced in Sweden in 1873, and contained 33 per cent. manganese. In 1875, at Terre-Noire, Pourcel made in the blast furnace some ferromanganese that contained 75 to 80 per cent. manganese. Since that time up to a few years ago all ferromanganese was made in the blast furnace. At present a comparatively small quantity is made in the electric furnace, the greater part of that so made being used for the production of ferromanganese-silicon or silicomanganese. When the iron-manganese alloy contains less than 25 per cent. manganese it is called spiegeleisen; when it contains more than 25 per cent., it is called ferromanganese.

EXPERIMENTS IN FERROMANGANESE PRODUCTION

Stassano in 1908 made some experiments in the production of ferromanganese in a 75-kw. electric furnace of the type of the Stassano steel furnace. The charge consisted of 1000 parts of manganese ore, 300 parts of charcoal, 60 parts of lime, and 80 parts of 25 per cent. sodium silicate used as a binder for briquettes of the above composition, the form in which the charge was smelted. The ore used contained 45.65 per cent. Mn_2O_3 , 16.1 per cent. Fe_2O_3 , 3.05 per cent. Al_2O_3 , 30.16 per cent. SiO_2 , 0.15 per cent. BaO , 1.2 per cent. CaO , 0.43 per cent. MgO 0.817 per cent., S, and 0.3 per cent. P. The desired product was to be silicomanganese containing about 60 per cent. manganese and 20 per cent. silicon. The charge was submitted to the heat radiated from the arc, as in all Stassano furnaces.

The product contained 17.76 per cent. iron, 17.6 per cent. silicon, 62 per cent. manganese, 1.8 per cent. carbon, 0.028 per cent. phosphorus, and a trace of sulphur. No data showing the losses of manganese were given. The energy consumption was 3.86 kw-hr. per lb., or 7560 kw-hr., 0.86 kilowatt-year, per long ton.

THE THEORY OF PRODUCTION

Ferromanganese is manufactured from manganese oxide ore with carbon as a reducing agent. Because of the high reduction point of manganese

dioxide, 1105 deg. C., considerably more coke is necessary in the blast-furnace charge than in the iron blast furnace. Reduction takes place in the electric furnace according to the reaction:



For the reduction of 100 parts of manganese, 43.5 parts of carbon are necessary.

Ferromanganese usually contains about 6 per cent. carbon, when it is silvery white. When the silicon content in the alloy is low, the carbon is all in the combined state. With more than 5 per cent. silicon the carbon falls to about 2 per cent., and as the silicon increases the carbon in the alloy decreases.

THE PROCESS OF MANUFACTURE.

Ferromanganese is still manufactured almost entirely in the blast furnace. When the manufacture of ferroalloys in the electric furnace began, attempts were made to make ferromanganese. These failed, chiefly because of operation of the electric furnace at so high a temperature as to produce great volatilization of the manganese. As the electric furnace became better understood, heating by resistance only was found possible, thus insuring a low enough temperature.

In the Blast Furnace.—Most of the blast-furnace ferromanganese used in this country, with the exception of that made by one large corporation, is made in England. In recent years some German ferromanganese has been put on the market here. Russian or Turkish manganese oxide ore is used. Ores high in silicon cannot be used because of the high loss of manganese as silicate in the slag. The results of a typical blast-furnace run, including figures as to the ore used, and the slag and the alloy produced, are given in the table below. In this run the average amount of coke consumed was 2.37 gross tons per gross ton of ferromanganese produced. Of the total manganese charged 76.9 per cent. was saved and 23.1 per cent. lost. Of the total slag lost 6.7 per cent. was in the slag and 18.4 per cent. was volatilized or lost as dust.

Results of Blast-Furnace Run to Produce Ferromanganese*

Ore		Slag		Ferromanganese	
Constituent	Per cent.	Constituent	Per cent.	Constituent	Per cent.
Mn	51.6	SiO_2	30.32	Mn	80.20
Fe	1.46	FeO	1.41	Fe	11.80
P	0.173	MnO	8.52	Si	1.16
SiO_2	7.80	Al_2O_3	10.88	P	0.38
Al_2O_3	1.12	CaO	41.34	C	6.46
CaO	1.86	MgO	2.96		
MgO	2.11	P_2O_5	0.01		
BaO	2.20	CaS	3.94		
		BaO	0.48		

*Jakobi, J., Ferromanganen in Hochofen; Stahl und Eisen, vol. 29, 1909, p. 1191.

The loss of manganese by volatilization, or as dust, varies between 15 and 20 per cent. of the total quantity of manganese charged. The average total loss is about 30 per cent., of which 10 per cent. goes to the slag and 20 per cent. is volatilized or lost as dust. Any phosphorus in the ore goes to the metal, but there is no difficulty in slagging the sulphur. No more than 0.02 per cent. of phosphorus should be present for each 10 per cent. of manganese in the ore. The manganese as a rule is unevenly distributed through the alloy. Usually some limestone is necessary in the charge. The alloy produced in the run discussed above is high in phos-

phorus. An average English ferromanganese contains 83.4 per cent. manganese, 9.04 per cent. iron, 6.5 per cent. carbon, 0.8 per cent. silicon, 0.25 per cent. phosphorus, and 0.01 per cent. sulphur.

In the Electric Furnace.—When ferromanganese is being made in the electric furnace, the electrodes and voltage are regulated so as to prevent arcking. With a mixture of 813 parts of ore containing 30 per cent. manganese, 178 parts of anthracite coal (4 to 5 per cent. ash), and 90 parts of fluorspar, about 450 pounds of product was obtained per ton of mixture treated. The product contained 85 per cent. manganese. Of the total manganese charged 26.8 per cent. was lost by volatilization, as dust, and in the slag. Ferromanganese made in the electric furnace has considerably lower carbon content than the blast-furnace ferromanganese, and is used in the molten state by the ferro-alloy manufacturer for making silicomanganese.

OBITUARY

GEORGE LAWLEY, Boston, Mass., head of the famous house of yacht and ship builders, died February 27, aged 92 years. He was born in London, England, and came to the United States in 1851. Three years later he established a shipyard in East Boston, moved the plant to Scituate, Mass., in 1866, and founded the original South Boston yard in 1874. It was there that Mr. Lawley and his son George F. Lawley built the cup defenders Puritan and Mayflower and many other famous yachts, as well as other vessels, including several fighting craft for the United States Government. When the business was incorporated in 1890 Mr. Lawley retired from active management. He was prominent in the Boston Branch, National Metal Trades Association.

HENRY G. RUDOLPH, president Rudolph & Son Company, sheet metal manufacturer, Cleveland, Ohio, died February 28 of apoplexy, aged 69 years. He was born in Berlin, Germany, and came to America in 1866. After residing in Cincinnati for two years he located in Cleveland and formed a partnership in a sheet metal business under the firm name of Rudolph & Lewis, which afterward became the Rudolph & Son Company. He was one of the most prominent German citizens of Cleveland, was associated with a number of business organizations and was a member of the Sheet Metal Contractors' Association, the Cleveland Chamber of Commerce and several fraternal organizations.

JOSEPH MOHR, president of John Mohr & Sons, boiler makers, died March 1 at his home in Chicago, aged 60 years. Following his college course, he served as a boiler maker apprentice with the Excelsior Iron Works, Chicago, remaining with this company until 1882. With his father, he then organized the business which has grown to be one of the largest operations in heavy plate work in the Chicago district. He was general manager and treasurer of the company until 1903, when on the death of his father he became president.

FRANCIS A. MORRIS, general purchasing agent of the International Steam Pump Company, New York, died February 16 at his home in Yonkers, N. Y., after a short illness, aged 36 years. He had been with the company eight years and previously was connected with the New York Glucose Company. Born at Monson, Mass., he was a graduate of Amherst College, class of 1900. He leaves his widow.

Four members of the engineering commission of the Roumanian Government inspected steel plants in the Pittsburgh and Chicago districts last week, preparatory, it is said, to placing government orders for steel products. The commission is composed of Major D. Popescu, Capt. G. Bucliu, A. Popescu and A. Cantemir.

PERSONAL

John H. Burns was recently referred to in *The Iron Age* as being president of the Purchasing Agents' Association of Buffalo. He writes that he does not hold that position, his term having expired last summer, when he was succeeded by George W. Domedian, connected with the Lautz Soap Company. Mr. Burns is a member of the executive committee.

Dr. Hollis Godfrey, president of the Drexel Institute, is to address a meeting in New York of the American Society of Mechanical Engineers at the Engineering Societies Building, 29 West Thirty-ninth street, on the evening of March 9, on "The Application of Engineering Methods to the Problems of the Executive, Director and Trustee."

At the annual meeting of the Continental Can Company the directors were re-elected with the exception of Herbert Lehman, elected to succeed the late Edwin Norton. Philip Lehman was elected a member of the executive committee to succeed Mr. Norton. All officers were re-elected.

W. L. Kerlin, president Boulevard Machine Company, New York, has returned from London where he went a few weeks ago on business. He found the British War Office thronged with agents who wanted to sell their goods to the Government, many of whom had been waiting weeks for an interview with the proper official. A good part of the buying is done by contractors to the Government and Mr. Kerlin believes that American sellers can do as well with the commercial agent of the British Government in New York, although his own trip was moderately successful.

George T. Merwin has been made general sales manager of the Canadian Car & Foundry Company, Montreal. He was formerly with the W. W. Butler Company, Ltd., Montreal.

J. E. Johnson, Jr., is to address the Engineering Association of the State College of Pennsylvania at State College, Pa., March 9, on some phases of the power plant problem of the steel works.

The Thomas Iron Company, Easton, Pa., announces that J. E. Thropp, Jr., has been appointed superintendent of its Lock Ridge blast furnaces at Alburis, Pa. Charles E. Hulick, who has been superintendent of these furnaces, will now give all his time to the Hokendauqua plant, where No. 1 furnace will be blown in at once. Owing to the continued illness of James W. Weaver, secretary and treasurer of the company, Oliver T. Case has been appointed assistant secretary and Lawrence K. Diffenderfer has been appointed assistant treasurer, with authority to act during the absence of Mr. Weaver.

A. E. Borie, 50 Church street, New York, has resigned as a director of the Taylor-Wharton Iron & Steel Company.

George F. Murphy is now associated with the Heine Safety Boiler Company in charge of the sales offices at Pittsburgh, Pa. He was until recently sales representative in charge of the Eastern branch office of Busch-Sulzer Bros.-Diesel Engine Company, of St. Louis, Mo., with headquarters in New York.

Arthur C. Pletz, secretary and general manager of the Aurora Tool Works Company, Aurora, Ind., has resigned to engage in the manufacture of machine-tool specialties, with headquarters in the Commercial Tribune Building, Cincinnati, Ohio.

James Bushworth has been elected secretary and general manager of the Aurora Tool Works Company, Aurora, Ind., succeeding Arthur C. Pletz, resigned.

A. D. McAdam, formerly Western sales agent of the Ralston Steel Car Company, Columbus, Ohio, has been made sales manager for that company, with headquarters at Columbus.

R. V. Sage, formerly in the sales department of the Cambria Steel Company, Johnstown, Pa., but who resigned some time ago, is again in the service of that company in the same department.

STUDY IN STEEL CASTINGS

Effect of Chilling on the Structure and Properties
—Pouring Ingots

An unusually interesting study of the effect of the initial structure on the physical and other properties of steel castings as a result of cooling conditions, with special reference to the pouring of ingots, is offered by J. H. Whitely, of Stockton, England, in a paper read before the Cleveland Institution of Engineers. The following is an abstract:

Micrographical examination of a cogging-mill steel guide showed that in freezing, two entirely different structures had been formed. On the one side the normal fir-tree or "dendritic" crystallites had grown to a considerable size; on the other, the primary crystals had not developed in the same fashion; no dendrites were to be seen. This structure (which the author has found to be always present in castings in certain parts) may be termed "granular," to distinguish it from the dendritic. In endeavoring to ascertain the cause of the granular structure, drillings from each half of the guide were carefully tested. Analyses proved conclusively that the two structures were not due to any difference in the composition of the steel in the two parts.

CAUSE OF THE DIFFERENT STRUCTURES

In the examination of a large number of such sections from various castings, the position found to be occupied by the granular structure strongly suggested that it was caused by the sudden cooling of the molten metal when near the freezing point. The fact that runners invariably exhibit the dendritic type, whereas small heads or risers are usually granular throughout, is of itself almost sufficient evidence that this explanation is the correct one. By taking both samples with various carbon contents from an open-hearth furnace and cooling in different ways, the author obtained still further proof that chill induces the granular structure to form. Samples taken by pouring the liquid steel into a cold spoon gave a most decided, though very fine, granular structure when the carbon was below 0.40 per cent. These samples contained no manganese or silicon.

It may be concluded, therefore, that the octahedral fir-tree crystallites at once begin to form in steel which sets in contact with a heated surface, but if the metal is suddenly chilled by contact with a cold surface, the granular structure is first produced, often in a very marked degree. It is difficult to discover whether or not this structure gathers momentum, and continues to grow for a time after the rapid chilling has ceased, but, from one or two observations, the author is inclined to think it does, in some steels at any rate. How much effect silicon, manganese, and other elements have in accentuating or hindering its formation, he has not been able to ascertain. This result of chill on molten steel cannot be described as unique. The glassy marginal structure of intrusive rocks affords another instance of a similar nature. It follows that by etching, we are able to find the approximate position in which a casting was cast.

EFFECT ON PHYSICAL PROPERTIES

The microscopic examination of the guide showed that it had been properly annealed; and in order to obtain mechanical tests from the two types of structure, two lengths, 7 in. x 1 in. sq., were cut

from each half and prepared for tensile and bend tests. The results were as follows:

	Dendritic	Granular
Tensile strength, tons per sq. in.	30.0	33.7
Elongation in 3 in., per cent.	6.0	25.0
Contraction of area, per cent.	4.5	37.2
Bends, 1 in. x 1 in., in deg. Broke at	60	180

It is certainly astonishing that such diverse results should be obtained from the same casting in areas scarcely one inch apart. It is interesting to note that on forging one half of the broken dendritic bend down to a bar of $\frac{1}{2}$ in. sq. section and annealing, a perfect bend was obtained. An examination of a section from this piece showed that a complete re-arrangement of the phospho-concentrate areas had taken place in forging. All strips from the granular half of the guide bent well, whichever way they were cut. In the absence of intergranular sulphide films, the granular structure generally gives very good results.

We are thus led to infer that cast steel is weakest in directions at right-angles to the parallel dendrites which may be present, and so far, experiments made on other samples have confirmed this statement. Seeing that test pieces must of necessity be cast on the outside of the casting, it follows, from these observations, that the mechanical tests obtained from them can altogether fail to represent the true quality of the steel.

THE STRUCTURE IN TOP OR BOTTOM-RUN INGOTS

Considering the subject briefly in connection with the casting of steel in the form of ingots, there are two or three points on which it may possibly throw some light:

1.—It is a common experience, the author believes, that large ingots, filled from the bottom, or bottom-run, give better surfaces in the rolled material than those teemed from the top, or top-run. No doubt the absence of splashing has much to do with this, but the foregoing remarks suggest another and different reason. In the case of top-run ingots, the chilling of the molten steel by the cold metal of the mold, as it is filled, will give rise to the formation of the granular structure in the skin. At the solidus point, the partially set phospho-ferrite method, which of course contains most of the carbon at that temperature, will be a source of great weakness, especially in high-sulphur steel or in steel containing an excess of silicates through over-oxidation. On the other hand, in filling bottom-run ingots the mold will be heated to some extent as the molten metal rises; and when freezing commences, the fir-tree crystallites will, probably, immediately start to form in the lower half of the ingot. Now it is just this part which is the most liable to crack. It is sounder than the upper half, having fewer subcutaneous blowholes which help to relieve the strain on the outer skin due to contraction. The interlocking branches of the dendrites in the bottom-run ingots should tend to strengthen rather than weaken the skin at the solidus point, and the globular form taken by the non-metallic impurities in this type of structure will not be very harmful. These ingots, therefore, will be less liable to cracking of the skin in setting than those top-run, and consequently the finished material will have fewer seams and fractures. Conclusive proof of the correctness of this explanation can only be obtained by the examination of sections from five to ten-ton ingots, and even then, in mild steel, such costly experiments might fail to give any evidence owing to the diffusion of the phosphide.

2.—In rolled material, such as plates, the sulphide and silicate of manganese are often present in fine broken threads, as well as in the usual ellipsoidal

form. It seems quite reasonable to infer that the former variety is the result of the presence of cellular films in the ingot, while the latter is due, of course, to compression of the globules. These strings of impurities in plates are much more dangerous than the broader and shorter masses. They are apt to cause failures in the cross bends.

3.—There can be no doubt that the extent of diffusion of the phosphide that takes place depends, to a great degree, upon the length of time in which the steel cools down to about 1300 deg. C. It is evident, therefore, that more diffusion must occur in, say, a ten-ton than in a five-ton ingot, and for this reason alone, without considering the greater amount of work required in rolling down, the steel from the larger ingots should be of the better quality, which, the author believes, is actually the case.

Pittsburgh and Nearby Districts

The annual meeting of stockholders of the Pittsburgh Valve, Foundry & Construction Company was held in Pittsburgh February 24, at which directors were elected as follows: Henry M. Atwood, Joseph T. Speer, Charles A. Anderson, William Price, John McCaffrey, James D. Rhodes and Samuel G. Patterson. The directors organized by electing officers as follows: Joseph T. Speer, chairman; Charles A. Anderson, president; J. Roy Tanner, vice-president in charge of sales; S. G. Patterson, secretary and treasurer; J. Roy Tanner, general manager, and A. Roy Carson, auditor. The retirement of Henry M. Atwood, formerly chairman, from the activities of this company in October of last year afforded an opportunity to give deserved promotion to the above named officials, all of whom have been in active service in the company for many years.

The Slater, Marsden & Whittemore Company, Beloit, Wis., manufacturer of punches, shears and bending rolls, has appointed L. A. Green, 1409 First National Bank Building, Pittsburgh, dealer in new and used equipment, its representative for western Pennsylvania and eastern Ohio.

The Renzor Mfg. Company, manufacturer of stoves, pipe hooks, etc., Mercer, Pa., is having plans drawn by H. Edsall Barr, Erie, Pa., for a four-story addition to its plant, 60 x 260 ft. J. T. Renzor is president.

The United States District Court, Pittsburgh, has instructed receivers of the United Coal Company to make a contract with the Pressed Steel Car Company to repair 1000 coal cars belonging to the former. It is said these repairs will amount to about \$8000 per month until completed.

The blast furnace of the Struthers Furnace Company at Struthers, Ohio, which met with an accident early in February, has been repaired and is again in operation. The entire output of this furnace is taken by W. P. Snyder & Co., Pittsburgh.

The Universal Sanitary Mfg. Company has decided to install a complete continuous kiln system in its plant at New Castle Junction, near New Castle, Pa. C. J. Kirk is president.

Plans are being made for the erection of an eight-story fireproof warehouse at Thirteenth and Etna streets, Pittsburgh, which is to be 222 x 350 ft. in size. The site was formerly occupied by the office building and mills of the Zug Iron & Steel Company. The new structure will require about 5000 tons of structural steel.

Stockholders of the Parkersburg Iron & Steel Company, operating sheet mills at Parkersburg, W. Va., have re-elected officers as follows: C. F. Niemann, president and treasurer; A. E. Niemann, first vice-president, and N. S. Snyder, second vice-president, all of Pittsburgh. The Parkersburg Specialty Company, an identified interest, has elected officers as follows: C. F. Niemann, president; A. E. Succop, vice-president, and C. F. Gardner, secretary and treasurer.

The firm of W. N. Kratzer & Co., structural steel fabricators of Pittsburgh, has been succeeded by a Pennsylvania corporation and will hereafter be known as the W. N. Kratzer Company. The incorporators

are W. N. Kratzer, Harold Rapp, Robert E. Davison and Adam Krebs, all of Pittsburgh.

The bi-monthly meeting of the structural section of the Engineers' Society of Western Pennsylvania was held in its rooms in the Oliver Building, Pittsburgh, on Tuesday evening, March 2. Frederic H. Fay, consulting engineer of Boston, read a paper on "The Protection of Metal Structures."

Charles L. Kirk, Farmers' Bank Building, Pittsburgh, has taken on the account of the R. J. Watters Company, Buffalo, N. Y., manufacturer of sulphuric acid for pickling cold-rolled and cold-drawn steel.

The Safety Amorite Company, Pittsburgh, a subsidiary of the Garland Corporation, has received an order for 250 miles of conduit for the new Brooklyn subway to be constructed under the direction of the New York Municipal Railways Corporation. The order comes through the General Railway Signal Company, Rochester, N. Y., and aggregates 1,000,000 lb. This is said to be the largest single order for conduit ever placed.

The Carbon Limestone Company, Youngstown, Ohio, has awarded a contract to the Allis-Chalmers Mfg. Company, Milwaukee, Wis., for the installation at its Hillsville, Pa., quarries of grinding machinery for the manufacture of pulverized limestone for fertilizer uses. The new plant will cost about \$40,000 and will have a capacity of 100,000 tons of limestone per year.

The skelp mills of the Carnegie Steel Company at its Farrell works, which have been idle for some months owing to dull trade, will probably be started up in the near future. The plant is now being put in shape for operation, to have it ready should the company decide to start it.

The Trumbull Steel Company, Warren, Ohio, recently made a large shipment of tin plate to Alaska. It represented an entire train load and required about 25 cars to handle it. It goes by way of the Panama Canal to San Francisco, and at that point will be reloaded for shipment to Alaska.

The Underfeed Stoker Company of America has contracted to install an underfeed stoker under a 300-hp. boiler for the Vandergrift Electric Light & Power Company, Vandergrift, Pa. This is the second installation of an underfeed stoker at this plant.

Chester & Fleming, engineers, Pittsburgh, are preparing plans and specifications for a 6,000,000-gal. mechanical filtration plant, new pumping station and additional force mains to be installed in the city of East Liverpool, Ohio. The plant will cost about \$334,000, and the work will be ready to be advertised for bids about May 1.

The annual meeting of stockholders of the Continental Supply Company, an identified interest of the Youngstown Sheet & Tube Company, was held in Youngstown, Ohio, last week at which directors were elected as follows: James A. Campbell, C. S. Robinson, Richard Garlick, George E. Day, L. J. Campbell, W. H. Adams, W. R. Wilkerson, W. K. Hughes and W. E. Manning. The report of operations shows that the company had a fairly satisfactory year, when the general business depression is considered.

The William B. Scaife & Sons Company, Pittsburgh, has received a contract from the Duquesne Reduction Company for the structural steel work in connection with its new Cottrell treater for dust precipitation and by-products.

The Atlantic furnace of the Republic Iron & Steel Company at New Castle, Pa., was blown in on Monday, March 1. It had been idle for over five months.

The Girard Iron Company, which has 88 puddling furnaces at Girard, Ohio, will have all of them in full operation this week. The company is operating one skelp mill on double turn and one plate mill single turn. It is paying \$6 per ton for puddling, a somewhat higher rate than is called for in the present Amalgamated scale.

The J. E. Moss Iron Works, Wheeling, W. Va., will erect an addition to its plant.

The Steel Improvement Company, Cleveland, Ohio, has started to install two 10-ft. heating furnaces which will increase its capacity 100 per cent. on certain classes of heat treatment work.

Machinery Markets and News of the Works

The making of deliveries, particularly those where promptness is specified, is now a serious problem for many makers of machine tools. In some cases shipments cannot be made for several weeks and even months. It is conceded that the marketing of metal-working machinery was on a far better scale in February than in the same month a year ago. Not only has there been an increase in the business which can be attributed to the war, but betterment is shown also in the demand which is coming from domestic industry. In New York dealers are selling many machines for export, and railroads are showing more interest in shop equipment. In New England the conviction that increasing activity rests on a firm basis is stronger. In Cleveland there has been a better volume of orders, and manufacturers are seeking skilled help. In this city the call for second-hand machinery for shrapnel-making demonstrates the scarcity of new machines of the types wanted. Exports are a continued feature in Cincinnati, where one builder has received an order for radial drills and planers for export. These are tools which have been inactive. Steady improvement is felt in Detroit, and it is noted that automobile manufacturers are buying tools and taking on more men. Inquiries are heavier and orders are increasing in Milwaukee. The boiler trade is more active in the Central South, but prospects in other lines continue to develop slowly. Good crop conditions inspire hope in Texas. There is a steady and general improvement in the St. Louis machine tool market. On the Pacific coast small tools and mill supplies are in normal demand, and there is promise of better business with the increasing activity of the large industries peculiar to that section.

New York

NEW YORK, March 2, 1915.

The export demand for machine tools continues on a large scale; but greater interest is taken in the business which is coming from home manufacturers who have taken orders for munitions of war and who are inquiring for large quantities of tools. Some of these inquiries are from a firm who tested the market several weeks ago, and whose activity has been revived. There is a great deal of talk of shrapnel and projectile contracts and of a consequent desire to buy machines, though where the latter are to be obtained in large quantity and with promptness is a question. It requires only a few different kinds of machines, but a great many of them, to insure a large production of shrapnel, and the makers of these machines are admittedly unable to fill deliveries. In fact the difficulty in getting machines promptly is the sore spot in the situation so far as war business is concerned.

Several dealers are getting more of the direct or indirect war business than has been the case heretofore; and the view of one is that buyers are now compelled to take miscellaneous tools wherever they can find them, inasmuch as the manufacturers have their hands full. Lathes are in great demand for roughing shrapnel. In good demand also, and difficult of delivery, are milling machines, turret lathes, automatic machines, grinding machines and drilling machines. The call for planers and shapers is not great. Radial drills are moving a little better.

A steel company with plants at Pittsburgh and in New Jersey is reported to have received an enormous order for projectiles of sizes up to 13 in. It has made at least a tentative inquiry for 400 engine lathes. It is reported also that a locomotive company will make 6-in. shells. An Eastern company making electric motors and another making gas engines have been making inquiry for shrapnel-making equipment. An inquiry from a company manufacturing car-heating and lighting equipment has been revived. Turret lathes are wanted. A prominent seller of machinery with whom business of the sort referred to is extremely brisk emphasizes the statement that prospective buyers in regular lines of manufacture should take action without delay if their equipment needs any replenishment, as the matter of deliveries is steadily becoming more serious.

Hope for more active railroad buying is predicated on a few purchases by Eastern lines. The Philadelphia & Reading has purchased a Cleveland multiple punch capable of punching a 3-in. hole through 1½-in. stock, and two punches from the Hilles & Jones Company, capable of punching 1¼-in. holes through 1-in. material. The Erie Railroad has bought a Cleveland combination punch and shear, with a 72-in. throat, capable of punching a 1¼-in. hole through 1¼-in. stock for delivery to Hornell, N. Y. The Delaware, Lackawanna & Western has made inquiries for a few machines.

The Maryland Steel Company, Sparrows Point, Md., which is increasing its shipbuilding facilities, has purchased a big dock crane.

L. H. Pounds, borough president, Brooklyn, N. Y., will receive bids until 11 a. m., March 17, for mechanical equipment for a pumping station.

Samuel J. Mason, city engineer, Perth Amboy, N. J., will receive bids until March 24 for a 12,000,000-gal. pump, to

cost about \$35,000. Specifications call for a horizontal duplex double-acting compound condensing crank and flywheel type of pump of not less than 138,000,000 ft. lb. per 1000 lb. of dry steam consumed.

Peter Kroeger, city clerk, Perth Amboy, N. J., will receive bids until 8 p. m., March 24, for a pumping engine for the waterworks.

The Box Car Flush Door Company, 39 Cortlandt street, New York, has increased its capital stock from \$50,000 to \$250,000, for the purpose of acquiring additional patents. Manufacturing facilities will not be decided upon for some time.

The Fulton Rubber Type Company, 128 Fulton street, Elizabeth, N. J., is making preliminary arrangements for the erection of a factory in the course of a year or so.

The American Can Company, 447 West Fourteenth street, has awarded the contract to H. H. Hawkins & Bro., Bridgeton, N. J., for the construction of a three-story cement block building, 65 x 140 ft., to be used largely for warehouse purposes. N. M. Loney, 447 West Fourteenth street is the engineer.

The American Lead Pencil Company, 220 Fifth avenue, New York, has filed a certificate with the Secretary of State increasing its capital stock from \$1,000,000 to \$2,000,000.

The New Jersey Hygeia Ice & Cold Storage Company, 55 Badger avenue, Newark, N. J., has let the contract to Ferdinand Krack and Paul Otto, for an addition, 31 x 115 ft., one story, of brick construction. The York Mfg. Company is installing a 90-ton ice plant.

The Excelsior Bag & Tent Company, Watervliet, N. Y., has been incorporated with a capital stock of \$25,000. It will establish a factory. The incorporators are E. M. and H. J. Bartle, Watervliet, and F. W. Neary, Cohoes.

The Aetna Dynamite Company, Millbrook, N. Y., has filed articles of incorporation and will engage in the manufacture of dynamite and other explosives. E. Mochram, F. Houston, Jr., and F. E. Fenton, Jr., 2 Rector street, New York City, are the incorporators. The capital stock is \$100,000.

Incorporation papers have been issued to the Cuba Knife Company, Cuba, N. Y., capitalized at \$25,000, to manufacture pocket knives, kitchen cutlery, etc. The incorporators are G. L. Robinson, C. A. Wheeler and H. P. Morgan.

The Pure Water Service Corporation of Westchester County, Yonkers, N. Y., recently incorporated with a capital stock of \$250,000, will manufacture filtration plants, etc. A. N. Doyle, 34 North Broadway, Yonkers; L. H. Moore and E. B. Papen are the incorporators.

Philadelphia

PHILADELPHIA, Pa., March 1, 1915.

The Ford & Kendig Company, 27 North Seventh street, Philadelphia, Pa., manufacturer of steam plant and plumbers' supplies, has awarded contract to the Belmont Iron Works, Philadelphia, for an addition to its fabricating plant, 75 x 110 ft., to be used for bending, flanging and welding wrought pipe, up to 24 in. in diameter, for high-pressure power-plant construction. The estimated cost is \$7500.

The Autogenous Welding & Equipment Company, 1531 Maryland avenue, Baltimore, Md., has awarded the contract to Henry Momberger, 24 West Chase street, Baltimore, for

the construction of a one-story brick shop, 28 x 98 ft., to be erected at 1217 Maryland avenue for welding operations. John J. Kramer is in charge.

W. W. Boswell, Roanoke, Va., is in the market for a second-hand, 80-hp. boiler, with large fire-box, to consume wood.

E. A. Quisenberry, Lexington, Va., will establish a plant for the manufacture of cider, and will purchase a boiler, an engine and special machinery.

New England

BOSTON, MASS., March 2, 1915.

When business commenced to revive in January a good many manufacturers, in answer to the question as to conditions, qualified the statement that things were better by the remark—which was singularly unanimous—"but I don't know how long it will last; it may be only a flurry." That was the period ending a month ago. The situation in New England certainly demonstrates that the improvement is no flurry. Practically every manufacturing industry which has felt the change has at least maintained betterment, and in a great many cases has noted a gradual strengthening, both in actual orders and in that most promising sign of activities, a growing volume of inquiries. The works office feels better and so does the man on the road.

The average traveling salesman in the metal industries has altered his attitude toward the present and the future of business most decidedly. These men went through months of very lean picking. Many of them "laid up," believing that they could do no good among their customers commensurate with traveling expenses. Now their activities are apparent everywhere. They are finding orders and requirements which should develop into placed business on an increasing scale. Their experience is an important verification of the current opinion that 1915 should total a very fair year.

In New England the mill supply business reflects the prosperities of the various staple and the miscellaneous lines of manufacturing industries, including textiles. The rubber business is going at top speed, probably passing all previous records, if the experts are to be believed. And for several seasons past quite a number of these mills were not really prosperous at any time, and these were periods of dulness. Woolens and worsteds appear to have made a gain. Narrow fabrics are in large demand, as is reflected by the activities of the machine shops building this type of machinery. The cotton goods situation has not changed much; some of the mills are busy, others are not. The growing scarcity of European goods is having an increasingly wholesome effect. For example, a great thread mill in Connecticut employing 2000 hands put its last department on full time this week. The silk business has been exceedingly prosperous for months. Now the lace business is feeling the shortage of imports of foreign goods, and is prospering accordingly. The total result is a continuation, and probably a material enlargement of the average activities of the textile machinery industry, which constitutes a large factor in this territory's purchasing power in the machinery market. No one should get the impression that business averages close to full capacity. Industry as a whole is materially below that point, yet the difference in production in dollars and cents between today and the high tide of 1906-1907 would probably favor today. In the interim, works have increased greatly in their capacity, and many new mills, shops and factories have been established. Omitting the correction of normal increase, the New England industries stand very well indeed. Including that correction they are on the road to full capacity, for their production is growing, gradually; but according to current opinion, certainly.

The experience of the jewelry manufacturers of Providence, R. I., and Attleboro, Mass., affords another instance of the dependence which European exporters must place upon the United States in order to take care of their foreign trade. It is stated, upon what seems to be reliable authority, that German exporters have placed large orders in these cities for jewelry, most of which is destined, it is said, for South American countries. Reports of other business resulting from the lack of supplies from the factories of home countries of European shippers are heard occasionally.

The Billings & Spencer Company, Hartford, Conn., manufacturer of machinists' tools, drop forgings and forging machinery, has placed contracts for important alterations of its new property, recently the home of the Columbia Motor Car Company. A forging department will be created 80 x 450 ft., with a steel monitor roof. The reconstruction of another of the large buildings, taking out the second floor to give head room for electric traveling cranes, affords space for a machinery department, for the manufacture of drop

hammers and other forging machinery. A new steam plant will provide 1000 hp. When these operations are completed the company plans to begin moving operations, which will be accomplished gradually, so that full occupancy will not come much before the end of the year. The company finds business in general to be improved. Practically all departments are running full time; but in the total the works are short about 15 per cent. of their full quota of men.

The addition which the Bantam Anti-Friction Company, Bantam, Conn., plans to build will be 32 x 150 ft., two stories, of concrete throughout. It will be used for increasing the company's manufacturing facilities.

Regarding the rebuilding of the foundry of the Howe Scale Company, Rutland, Vt., the foundations are completed and the erection of the steel is about to begin. The structure will be 120 x 288 ft.

John Bath, well known in the machine-tool industry as a designer and builder of grinding machines, and Matthew G. Fitzpatrick, recently superintendent of Boynton & Plummer, Inc., Worcester, Mass., have leased space in the new Osgood Bradley industrial building in the latter city. Mr. Fitzpatrick recently purchased the Boynton & Plummer business, the specialty of which is blacksmiths' machinery and tools, and Mr. Bath has taken a share in the enterprise, which probably will be given a new name. A line of grinding machines will be included in the product.

An unconfirmed report from Devon, Conn., states that the American Brass Company contemplates the erection of a plant in that town on land purchased on the Housatonic River, on the Stratford side.

Greenwich, Conn., has authorized the sewer commission to construct a sewer system and disposal plant, in East Port Chester, at a cost not to exceed \$106,800.

According to legislative action, Beverly, Mass., will be asked to appropriate \$50,000 as the initial contribution to a plant for the Ipswich River water supply project. Salem, Mass., at the same time will be asked to appropriate \$100,000 for the same purpose. The commission in charge has given notice that it will receive bids for electrical pumping machinery. The contract will cover an electric motor-driven centrifugal pump, a steam-driven generator and transmission accessories. Bids will be received at the City Hall, Salem, Mass., up to 10 a. m., March 10.

Franklin, Mass., has sold \$75,000 of sewer bonds.

Lexington, Mass., has voted to install a sewage system at a cost of about \$100,000.

Chicago

CHICAGO, ILL., March 1, 1915.

Local machinery dealers find themselves with what are probably the smallest stocks of tools they have had on their floors for a long time. On the one hand, sales for export have been so heavy as to exhaust the immediate supply of some dealers, particularly of lathes and milling machines, while on the other hand the replenishment of stock has been seriously handicapped by the sold-up condition of the manufacturers. An order for 200 lathes and another for 200 milling machines are examples of recent export requirements in the filling of which local interests have participated. Buying of tools by local manufacturers is also reported to have improved, complete equipments for several new plants having been placed in the past few weeks.

The American Eyeless Tool Company, Chicago, has been incorporated with a capital of \$5000 by J. Franklin Duffy, 1521 East Fifty-sixth street; Harry F. Waters and E. H. Tillson to manufacture tools and machinery.

The Paul Pierson Mfg. Company, Chicago, organized with a capital stock of \$250,000, will deal in machinery, appliances and plants. The incorporators are H. E. Osborn, 155 North Clark street; J. J. Gruenfeld, Jr., and Paul Pierson.

The Spring Governor Company, Chicago, has been incorporated with a capital stock of \$100,000 to manufacture spring governors and other devices for automobiles, etc. The organizers are John A. Macknight, J. J. Cullen, J. F. Mooney, 3517 Greenview avenue; C. John Dahlstrom and Homer Milligan.

L. E. McGann, commissioner of public works, Chicago, Ill., will receive bids until 11 a. m., March 12, for five pumping engines.

The planing mill of the H. M. Boals Planing Mill Company, Alton, Ill., has been burned with a loss of about \$15,000.

The Imperial Tool Company, Bloomington, Ill., has been incorporated with a capital stock of \$75,000 by A. C. Eddy, C. C. Gilliland and J. M. Ijems.

The H. C. Cole Milling Company, Chester, Ill., has let the contract for a mill to cost \$80,000 and will shortly buy milling equipment to replace its plant recently destroyed by fire.

Stronghurst, Ill., has authorized the issuing of \$12,000 in bonds to build a waterworks.

The Gillam Wire Wiping Machine Company, Kokomo, Ind., has been granted a charter with a capital stock of \$25,000, to manufacture wire wiping machines. The following are the directors: Wm. O. Gillam, Andrew A. Gillam and Benjamin Havens.

Galesburg, Ill., has been notified by the Illinois River and Lake Commission to reconstruct its sewage disposal system, which it is estimated will cost about \$1,000,000.

Onawa, Iowa, will receive bids until March 9 for the construction of a sewer system. M. Collins is city clerk.

The Northwestern Railroad has recommended the expenditure of not more than \$100,000 for an addition to its roundhouse at Boone, Iowa. It is to be of brick and concrete, containing thirteen 90-ft. stalls and a modern machine shop.

Burton, Kan., has voted \$25,000 in bonds for the installation of a waterworks system.

George Wetterhold, Wichita, Kan., will build a factory for the manufacture of a patented hay, feed and grain-grinding machine. The total cost of the plant will be \$20,000.

The Bettendorf Company, Davenport, Iowa, is to build a big addition for the manufacture of wooden box-cars. It will include a sawmill, planing-mill and complete wood-working factory.

Haskins Brothers & Co., Omaha, Neb., will erect an addition to their plant, 42 x 116 ft., three stories, of brick construction.

The Firestone Tire & Rubber Company, Omaha, Neb., will build a three-story factory, 37 x 140 ft., on Farman street. F. C. Rudisell is manager.

William Leithauser, 845 Fairmont street, Midway, Minn., is receiving bids for the construction of a factory, 40 x 80 ft., one story, of brick construction. The location of the plant has not been definitely decided upon.

Milwaukee

MILWAUKEE, WIS., March 1, 1915.

February machine-tool operations were considerably in excess of the January volume. While not meeting the total of former years, the month's trade shows improvement over recent similar periods and the prospect for March is encouraging. The usual spring activity is setting in and cannot help but have a stimulating effect upon most branches of the metal trades. Inquiries are reported heavier, and actual orders, small in volume as they are, are increasing and make a respectable total. Municipalities are issuing the year's requirements for power, light and waterworks plants, and one private utility is figuring on an amount of hydroelectric equipment. A few large bridge jobs are in immediate prospect. Payrolls show a slight increase for the week, and the number of operatives employed during the month is larger than the January figure. Collections are reported slow.

The Green Bay Foundry & Machine Company, Green Bay, Wis., is establishing a department for the production of patented paper mill machinery, including roll-skinners, platers, bars, filters, etc. Two large equipment jobs are now in process of manufacture. I. E. P. Miller is president.

The Willard Mfg. Company, Minneapolis, Minn., manufacturer of electrical appliances and specialties, will move to Chippewa Falls, Wis., at once. The company is being reorganized as the Chippewa-Willard Mfg. Company, with a capital stock of \$30,000.

The Wisconsin Public Service Company, at its annual meeting in Milwaukee, discussed tentative plans for the construction of a hydroelectric plant at Johnson Falls, Wis., to cost \$300,000. The present plant at High Falls, Wis., will be continued. The company is composed of the Northern Hydro-Electric Power Company, Green Bay Electric Railway Company and Green Bay Gas & Electric Company, all operating in northeastern Wisconsin. Clement C. Smith, Milwaukee, is president.

The B. J. Johnson Soap Company, Fourth and Fowler streets, Milwaukee, has commissioned Lockwood & Greene, architects, 38 South Dearborn street, Chicago, to prepare plans for a factory addition of brick and reinforced concrete, 100 x 150 ft., six stories and basement, to cost \$130,000.

The Morgan Lumber Company, Oshkosh, Wis., has awarded the general contract for the erection of a wood-working factory to cost from \$25,000 to \$30,000, to the Fluor Construction Company, Oshkosh. It will be 80 x 94 ft., three stories, of brick and reinforced concrete.

The Babcock Automobile Spring Company, 187 Oneida street, Milwaukee, is about to erect a brick factory in Milwaukee for the production of spring assemblies for motor cars and trucks, and also a number of shock-absorbing devices. It will be 30 x 100 ft., one story, and will be located

on Milwaukee street, near Chicago street. George C. Ehlers is the architect, and Christ Schoknecht, general contractor.

Bloomington, Wis., is preparing to build a municipal waterworks system costing \$10,000. Plans are being prepared by L. J. Wolf, St. Paul, Minn., and contracts will be let late in March by M. F. Woodhouse, Bloomington.

The Pawling & Harnischfeger Company, Milwaukee, manufacturer of cranes and hoists, is placing on the market a line of farm drainage excavators of all-steel construction.

The Monarch Light Truck Company, Milwaukee, has been organized with a capital stock of \$50,000, by R. A. Fuhrman and Edwin O. Klann, to manufacture motor-propelled and manual transportation machinery.

The Modern Steel Structural Company, Waukesha, Wis., has changed its corporate style to the Federal Bridge Company.

The Prentiss-Wabers Mfg. Company, Grand Rapids, Wis., organized recently with \$25,000 capital to manufacture automobile and agricultural metal specialties and devices, has leased the Charles Wiperman factory and is installing equipment, nearly all of which has been contracted for.

The R. & L. Instrument Company, Beloit, Wis., recently organized, will manufacture electric signaling devices for automobiles and motor trucks. Arrangements for factory space are now being made. H. D. Ball and Leonard S. Carr are the promoters.

Articles of incorporation have been filed in behalf of the New Butler Electric Light Company, New Butler, Waukesha County, Wis. The capital stock is \$10,000 and the incorporators include J. L. Mullenbach and Albert Peterman. New Butler is a new city established as the terminal and shop site for the Chicago & Northwestern Railroad Company's Milwaukee belt line.

Garages, with repair and machine shop departments, will be erected in Wisconsin cities as follows during the spring: E. H. Ramm, New London, \$5000; Louis Bushing, Prairie du Chien, \$3500; A. M. Gogin, Red Granite, for occupancy by Charles Byse, \$3500; Pioneer Automobile Company, Mayville; Glenn A. Hill, Green Lake; Paul & Rosenberg, Colfax, \$4000; Mark Tustin, Berlin, \$6500.

The Farmers' Terminal Packing Company, Hudson, Wis., has been incorporated with a capital stock of \$1,000,000, by northwestern Wisconsin interests affiliated with the American Society of Equity. It proposes to erect a packing, cold storage and elevator plant at Hudson. The incorporators are Ira J. M. Chryst, F. M. Moore, C. A. Todd, J. J. Loftus and F. A. S. Price.

Fire destroyed the veneering department of the Wisconsin Seating Company, New London, Wis.

Phillipson Brothers, Argyle, Wis., are having plans prepared by J. R. Law, Madison, Wis., for a fireproof garage and machine shop to cost \$200,000.

Bids will shortly be asked by H. W. Beumming, architect, Milwaukee, on the new factory to be erected by the C. B. Biederstorf Tobacco Company, Milwaukee, Wis., at a cost of \$40,000.

The Wisconsin Lakes Ice & Cartage Company, Milwaukee, Wis., is considering plans for a two-story foundry to cost \$10,000.

The Fritzlaff Hardware Company, Milwaukee, Wis., is considering plans for a factory to cost \$100,000.

The Green Bay Drive Calk Company, Green Bay, Wis., has been incorporated with a capital stock of \$75,000 by Arthur S. Holmes, Oshkosh; David Nys and Herman Forst, Green Bay. It will manufacture horseshoes and drive calks.

The Morgan Garage & Supply Company, Rhinelander, Wis., is having plans prepared for a garage and machine shop which will cost, including equipment, about \$20,000.

R. L. Hooker and L. Kittell, locomotive engineers, Green Bay, Wis., have organized the Hooker & Kittell Company and established a garage, machine shop and car agency at 313 North Monroe avenue, Green Bay.

The Farmers' Co-Operative Packing Company, Madison, Wis., has been organized with a capital stock of \$500,000, by Oswald Vessrig, Julius G. Kroken, Herman Schultz and John W. Pepper. It will erect and operate a packing plant and cold storage warehouse.

The Tilden Electric Light & Power Company, Chippewa Falls, Wis., has been incorporated with a capital stock of \$10,000 by E. G. and B. J. Walter.

Poynette, Wis., has awarded a franchise to the Poynette Electrical Company, organized by Perry L. Speed, which will lease the local waterpower and install generating equipment, etc.

The Standard Aluminum Company, Two Rivers, Wis., has increased its capital stock from \$250,000 to \$500,000. Information concerning its plans are not yet available, but the company has purchased a warehouse near its plant.

Cleveland

CLEVELAND, OHIO, March 1, 1915.

Machinery dealers are getting a better volume of orders, and the outlook is brighter than for some time. While the war demand is responsible in a large measure, either directly or indirectly, for the increased activity, a better demand from sources not affected by the activity of war material is largely responsible. The automobile trade is buying some machinery and rubber plants are adding equipment. Orders for several boring mills were placed last week by the Akron tire manufacturers. Second-hand machinery, particularly lathes, is moving very freely, due to the fact that prompt delivery cannot be secured on new machinery wanted. A local manufacturing plant has an inquiry out for from 60 to 125 lathes, placing this order depending on its securing a large order on shrapnel cases. The foreign demand for turret lathes has fallen off considerably. The railroad demand is still very light. That generally conditions are improving is indicated by a report issued by the Cleveland branch of the National Metal Trades Association, which states that within the past week or ten days its employment bureau had more calls for help from manufacturers in the metal trades than it had had during many previous months.

The Lees-Bradner Company, Cleveland, manufacturer of gear cutting machinery, has outgrown the capacity of its plant and has taken additional floor space in a near-by building in which new machinery is being installed. The additional space will provide the company with an increased capacity of about 50 per cent.

The Warner & Swasey Company, Cleveland, will shortly add considerably to its machinery equipment, having an inquiry out for lathes, drill presses, milling machines and planers to fill out the equipment in its various departments. It is probable that about 30 machine tools will be purchased. This will be in addition to a round lot of machine tool equipment bought by this company about two months ago.

The American Pipe & Tube Company, Toledo, Ohio, has been incorporated with a capital stock of \$10,000 by W. B. McCarthy and others.

A waterworks pumping engine with a capacity of 3,500,000 gal. per day and a new boiler will be purchased shortly by the city of Canal Dover to be installed in its waterworks pumping station.

The Steelback Ladder Company, Crescent, Ohio, is the name of a new company that is equipping a plant for the manufacture of extension ladders and combination step-ladders.

The Faultless Rubber Company, Ashland, Ohio, is contemplating additions to its plant that will include a two-story building, 60 x 180 ft., and a two-story wing, 50 x 50 ft. The Osborn Engineering Company, Cleveland, will prepare the plans.

The Storm Buggy Company, Fostoria, Ohio, has been reorganized and will build a two or three-story plant addition. J. H. Jones is president; and P. J. Glazier, general manager.

A. W. Bordman, director of public service, Toledo, Ohio, will receive bids March 18 for the construction and equipment of a high-pressure fire service pumping station.

The Village Council, Granville, Ohio, will receive bids until noon, March 9, for the construction of a sewage disposal plant, etc.

Port Clinton, Ohio, has voted \$10,000 of bonds for rebuilding its waterworks pump.

Butler, Ohio, has issued \$4000 of bonds for improving the municipal electric light plant. The purchase of a gas engine is also under consideration.

Middletown, Ohio, will issue bonds for equipping its waterworks, etc.

The Fostoria Packing Company, Fostoria, Ohio, will erect a new meat packing plant.

It is announced that the Excel Rubber Company, Akron, Ohio, will move to Wadsworth, Ohio, where it will erect a new plant.

The Board of Public Affairs, Gibsonburg, Ohio, will receive bids March 10 for a 35-hp. oil engine.

The Brunk Forging & Machine Company, Lorain, Ohio, will erect an addition to its plant and install some new equipment.

A. W. Boardman, director of public service, Toledo, Ohio, will receive bids until March 9, at noon, for the construction and equipment of a high-pressure fire service pumping station.

The board of trustees, East Palestine, Ohio, will purchase new electric light plant equipment that will practically double its capacity. W. H. Van Fossen is contracting agent.

Detroit

DETROIT, MICH., March 1, 1915.

A fair volume of business was transacted in the local machinery market last month and merchants generally were not dissatisfied, although sales did not reach the aggregate looked for. The outlook for March is characterized as promising. The past week has not brought forth anything of particular interest in the way of sales, although a considerable amount of single-tool business was transacted. The automobile manufacturers are making some purchases of machinery and are adding to their payrolls. In fact, the industrial situation seems to be improving steadily in numerous lines. Building conditions are extremely quiet for this time of year.

The Studebaker Corporation, Detroit, automobile manufacturer, has begun the erection of an additional factory to cost \$85,000. The new building will be 80 x 220 ft., four stories, and will be occupied by the steel stamping and enameling departments. Additional equipment will be installed.

The Wilson Foundry & Machine Company, Pontiac, Mich., has awarded contracts for the erection of four buildings and will add to its equipment. The company, which manufactures automobile parts, recently took over a part of the defunct Flanders Mfg. Company's plant.

The Greilick Mfg. Company, Traverse City, Mich., has been incorporated with \$150,000 capital to manufacture furniture. The incorporators are C. L. Greilick, C. B. Curtis and A. J. Haviland. The new company is a consolidation of the J. E. Greilick Company and the Traverse City Chair Company.

The Langeland Mfg. Company, Muskegon, Mich., is preparing to erect a factory for the manufacture of hardwood flooring, etc. Dry kilns will also be erected.

The Michigan Crown Fender Company, Ypsilanti, Mich., has increased its capital stock from \$10,000 to \$20,000 and will add to its plant and equipment. The company has moved its offices from Ypsilanti to Detroit.

The taxpayers of Schoolcraft, Mich., have voted in favor of bonding for the establishment of a municipal waterworks plant.

The Michigan Wire Goods Company, Niles, Mich., has increased its capital stock from \$20,000 to \$30,000, and will begin the erection of a four-story factory, 60 x 200 ft., to replace its plant recently destroyed by fire. William Reddick was at that time the proprietor. The present manager is C. H. Smith.

The American Specialty Company, Sparta, Mich., has been reorganized and will resume business under the name of the Sparta Mfg. Company. The company has been incorporated for \$100,000. A holding company will be organized, it is stated, with a capital stock of \$500,000 to take the entire output.

The Standard Oil Company, whose plant at Grand Rapids, Mich., was burned a short time ago, will soon commence work on the erection of a new plant, on the site of the old one, which will cost in the neighborhood of \$40,000.

The formaldehyde plant of the Cleveland-Cliffs Iron Company, Marquette, Mich., was destroyed by fire with a loss of \$50,000. No instructions regarding rebuilding have as yet been issued. Austin Farrell is manager of the furnace department.

Cincinnati

CINCINNATI, OHIO, March 1, 1915.

The machine tool business in February this year was far ahead of the corresponding month of 1914. This is due to the large volume of export orders that are still coming in. One prominent machine tool builder, whose plant is now working on a double shift, reports the receipt of orders for radials and planers from Europe. Another states that the lathe business is increasing instead of diminishing, and that when it will cease is only a matter of conjecture. Milling machines are also in demand, but shapers continue to be a drug on the market. Confirmation is lacking of a rumor currently circulated that a local machine-tool manufacturer had received a large domestic order for machines that were intended indirectly for the United States Government. The only thing to lend color to this report is the fact that the firm in question has commenced running an extra shift at night and on full time.

A very limited demand has arisen for second-hand machinery of all kinds. Dealers in new equipment are also complaining.

A canvass of the retail hardware dealers in Kentucky, whose annual convention was held in Lexington, Ky., last week, reveals the same condition as to stocks carried as was

previously reported as existing in Ohio. Not over 5 per cent. of the dealers are carrying anything like the usual stock, while fully 75 per cent. have smaller stocks than at any time since they were in business. This indicates that when they commence to place orders manufacturers and jobbers may be overrun with business.

The Electric Horsepowers Company, 906 Elm street, Cincinnati, has been incorporated with \$50,000 capital stock by Robert D. McCreery, and others. Manufacturing plans of this company were announced some time ago. Practically all equipment has been bought.

Garber & Woodward, architects, Union Central Building, Cincinnati, have prepared plans for a large school for which heating equipment will be required.

Plans have about been perfected for the reorganization of the Barney & Smith Car Company, Dayton, Ohio, and it is planned to lift the receivership of that firm not later than April 1. No additions to its plant are contemplated at the present time.

The Reliable Engine Company, Portsmouth, Ohio, has been incorporated with \$10,000 capital stock by Christian Heer, and others. It will take over the plant and business of the Heer Engine Company.

The proposed addition to the plant of the Maxwell Motor Car Company, Dayton, Ohio, recently mentioned, will be approximately 100 x 700 ft., one story, of brick construction. Work is to commence at an early date.

Work has been commenced on the five-story factory of the Elwood Myers Company, Springfield, Ohio, manufacturer of metal signs and other specialties.

Nelsonville, Ohio, is considering installing an additional engine in its waterworks plant.

The Hill-Standard Mfg. Company, Anderson, Ind., will erect a plant for the manufacture of wire wheels for farm cultivators.

Milan, Ohio, has sold \$6000 of waterworks bonds, and bids will shortly be asked for new machinery for the pumping station, etc.

The Kelley-Koett Mfg. Company, Covington, Ky., maker of X-ray apparatus, has let contract for an addition to its plant estimated to cost \$12,000.

The Inskeep Mfg. Company, Springfield, Ohio, has had plans prepared for a large addition to its plant on Western avenue.

The Middle West Supply Company, Columbus, Ohio, whose tentative building plans were mentioned last week, has acquired the plant of the Columbus Envelope Company, which it will fit up as a large printing plant.

John Castillini, 322 Longworth street, Cincinnati, has let contract for an ice and cold storage plant.

The Central South

LOUISVILLE, KY., March 1, 1915.

Machinery houses report fair prospects, but continue to find it difficult to convert them into orders. A general tendency to hold back and delay the installation of new equipment is evident. The situation is gradually opening up, however, and a better feeling is being shown by manufacturers. The boiler trade, which has been quiet, is somewhat more active, and electrical equipment houses have been getting some business. Though it is rather late in the season, ice machines are still selling fairly well, wood-working machinery is also a good item at present.

The Ford Motor Company, Detroit, will begin the erection of its Louisville assembling plant March 1. There will be a powerhouse and considerable special equipment, all of which will be purchased at the Detroit offices.

The Henry Vogt Machine Company, Louisville, has filed amended articles of incorporation fixing its capital stock at \$500,000.

The Puckett's Creek Coal Company, Burchfield, Ky., will purchase a boiler, engine, generator and motors for installation in its new mining plant. The cost of equipment to be purchased is \$20,000. John Howard is in charge.

The Southern Textile Machinery Company, Paducah, Ky., which, as recently reported, is to enlarge its plant, advises that it will need milling machines, boring machines, punch presses, etc.

The Business Men's Club, Newport, Ky., will erect a light manufacturing building as a means of attracting new industries. It will cost \$40,000.

The Floyd Mining Company, Emma, Ky., is in the market for a boiler, engine, generator and other power equipment for its coal-mining plant.

The Fooks Lumber Company, Paducah, Ky., will establish a sawmill.

The machine shop of Scott & Nelson, East View, Ky., was burned recently.

The power plant and distillery of John and Edward Oldham, Sand Lick Springs, Ky., was destroyed February 24 by an explosion.

H. L. Stone, Pikeville, Ky., has taken over the electric light plant at Hazard, Ky., which has not been operating lately, and will put it in shape to run.

The Danville Light, Power & Traction Company, Danville, Ky., will install additional generating equipment.

The Winchester Development Company, Winchester, Ky., has been incorporated with a capital stock of \$50,000 for the purpose of bringing manufacturing plants to that city.

The Co-operative Grain Elevator Company, St. Louis Crossing, Ind., will purchase equipment at a cost of \$7000.

The National Realty Company, Evansville, Ind., will build a grain elevator at Kentucky avenue and Division street.

The State of Indiana has voted \$216,000 for the state reformatory, Jeffersonville, Ind. Of this amount \$32,850 will be used in the installation of two water-tube boilers, hot and cold water pumps for boilers, etc. D. C. Peyton is superintendent.

J. T. Plumer, Salt Lick, Ky., will establish a factory at Winchester, Ky., for the manufacture of spools and other cotton mill equipment.

The Commercial Club, Winchester, Ky., has information about a furniture factory which is to be established there.

The Southern Textile Machine Company, manufacturer of knitting machinery, Paducah, Ky., will enlarge its plant. It expects to double its capacity.

The Anglo-American Mill Company, Owensboro, Ky., has increased its capitalization from \$200,000 to \$260,000. The capacity of its plant, which manufactures flour mills, may be increased.

C. P. Kennedy, Barbourville, Ky., will install a steam laundry. Boilers, transmission and special equipment will be purchased.

Bichon & Reddick, Bardwell, Ky., are planning the operation of electric light and water plants there.

Gill Edwards, Pembroke, Ky., has the contract for the construction and equipment of an electric light plant for the town of Smith's Grove, Ky.

Paris, Tenn., will install a 500-hp. generating unit in its electric light plant.

Frederick Andes, Milwaukee, Wis., will equip a marble mill at Vestal, Tenn., near Knoxville.

A. T. Williams, Watertown, Tenn., will equip a plant for the manufacture of insulator pins.

The Harlan-Morris Mfg. Company, Jackson, Tenn., advises that it is now receiving bids on the equipment of its sawmill and slack cooperage plant.

The City Light & Water Company, Waverly, Tenn., has been incorporated with \$4000 capital stock by H. W. Hooper and others.

Kennedy Brothers, Mont Eagle, Tenn., have made plans for doubling the capacity of their ice factory.

R. B. Jean, Shelbyville, Tenn., has started the construction of a garage and automobile repair shop, for which he will need machine tools.

The Bristol Iron & Wire Works, Bristol, Tenn., has been organized with J. G. Tilley, president; Henry L. Wilson, treasurer, and F. A. Reimann, secretary. Mr. Tilley is also president of the Twin City Boiler Works, Bristol.

The Weller-Hoard Table Company, Morristown, Tenn., is equipping a plant. A building has already been secured, and machinery will be installed at once. H. M. Weller, N. G. Weller, Sanford, N. C., and others, are among the incorporators.

Texas

AUSTIN, TEXAS, February 27, 1915.

No improvement in the machinery and tool trade situation is to be noted this week. Business conditions generally, however, are gradually growing better. Spring farm operations are unusually well advanced and everything points to another good crop season.

The city commission, Houston, plans to construct two municipal electric light and power plants. One will be devoted to providing light for city bridges and public buildings, and the other to furnishing power for operating the machinery of the municipal wharves that are to be built on the ship channel. The total cost of the two plants will be about \$75,000.

The Plano Grain & Ice Company, Plano, will build an ice factory. R. W. Sandifer is one of the stockholders.

The City Council, Thornton, has granted a franchise to Houston business men for the construction of an electric light plant.

Ira Peveto, Orange, will enlarge his ship and boat-building plant.

The Sweetwater Transfer Company, Sweetwater, will build a garage and machine shop.

A municipal waterworks plant will be built at Lott. Bonds for the purpose have been issued.

Bonds have been issued for improving the waterworks plant at Grand Saline.

E. P. Burdick, Wichita, Kan., will erect a grain elevator at Clovis, N. M. Considerable machinery will be required.

The board of directors of the Texas Power & Light Company, Austin, at a recent meeting at Dallas, authorized the issuing of \$250,000 additional bonds for the purpose of completing the improvements to its plants and transmission lines that are now in progress.

The machine shop of S. A. Whiteside, Roswell, N. M., was destroyed by fire with an estimated loss of \$3200.

The National Metal Weatherstrip Company of Texas, Ft. Worth, Tex., has been incorporated with a capital stock of \$1000 by R. J. Pence, W. F. Fry and E. A. Jackson.

St. Louis

St. Louis, Mo., March 1, 1915.

Machine-tool market conditions show steady and general improvement the past week. Some evidence is developing of a reduction in the available supply of lathes and similar machinery suitable for the manufacture of war munitions. Second-hand tools are in some request, and collections are reported good.

The D. C. Gilliland Mfg. & Auto Supply Company, St. Louis, has been incorporated with a capital stock of \$18,000 by David C. Gilliland, Elmo P. Orner, Harry and F. Spoene-mann.

The Mound City Buggy & Automobile Company, St. Louis, has acquired new quarters and will install additional equipment for the repair and assembling of automobiles and the manufacture of accessories.

Henry A. Strain, St. Louis, will equip an auto repair plant.

The St. Louis Kriterion Film Company, St. Louis, has been incorporated with a capital stock of \$100,000 by R. B. Dickson, R. E. Keaney, H. M. Walsh, and others, to manufacture moving picture films and apparatus.

The Reco Company, St. Louis, is reported in the market for one 15-kw. direct-current 115-volt direct-connected generator and one 220-volt rotary converter or motor-generator set to deliver direct current.

The Auto Transportation Company, Webb City, Mo., has been incorporated with a capital stock of \$30,000 by E. J. Pratt, D. C. Morris and A. H. Rogers.

The Flanagan-Zeller Brick & Mfg. Company, Kansas City, Mo., through H. J. Zeller, has bought the Flanagan Brothers' brick plant and will increase the capacity of the mechanical equipment.

The Hoosier Land & Investment Company, Sikeston, Mo., has obtained the contract for about 7,000,000 cu. yd. of excavation in the Little River Drainage District.

The William J. Callahan Construction Company, Elsberry, Mo., has obtained the contract for excavation, etc., in the Elsberry drainage district, and is in the market for necessary excavation equipment.

The board of public works, Carthage, Mo., will install a 50-hp motor-driven deep well pump and two 20-kw. transformers.

Elsberry, Mo., will install one 24-kw. alternating current generator with engine direct-connected. W. B. Ellis should be addressed.

J. W. Lowery, Dunnegan, Mo., has purchased the electric light plant at Fair Play, Mo., and will renew the entire plant.

The power plant and heating plant plans for the St. Joseph Hospital, Kansas City, Mo., will be completed shortly by Henrici, Kent & Lowry, engineers, Kansas City, Mo., who are in charge and will receive bids.

The Cleveland Steel Barrel Company, Cleveland, Ohio, will equip a branch plant at Kansas City, Mo., and will manufacture oil barrels.

The Colbert Machinery Company, St. Joseph, Mo., has been incorporated with a capital stock of \$15,000 by J. P. Colbert, R. C. Moler and B. T. Nelson, to deal in machinery.

The Arthur B. Mueller Heating Company, Kansas City, Mo., has been incorporated with a capital stock of \$12,000 by Arthur B. Mueller, W. R. Robertson and George E. Meuth-bach.

The Houston & Liggitt Pencil Company, Springfield, Mo., will install 12 motors and other equipment.

The board of directors of public schools, Kansas City, Mo., of which J. B. Jackson is secretary, will receive bids for a considerable amount of heating equipment. J. H. Brady, the engineer, is in charge.

The Missouri & Southeastern Utilities Company, Blytheville, Ark., has been incorporated with a capital stock of \$450,000 by W. W. Hollipeter, P. E. Cooley and A. G. Little, and will equip plants for the generation of heat and power, etc.

The Cabot Light & Power Company, Cabot, Ark., has been organized and will build an electric light and power plant. M. Young is president.

Corning, Ark., has granted a franchise for an electric light and power plant to G. A. Booser, who will proceed to install it.

The Arkansas Oak Flooring Company, Pine Bluff, Ark., will equip a plant of 50,000 ft. daily capacity. It has a capital of \$50,000. L. N. Anson, Merrill, Wis., is president, and H. W. Coles, Pine Bluff, manager.

Moreley & Son, McGehee, Ark., will install an ice plant of 35 tons daily capacity, with crude oil as fuel for power. About \$30,000 will be expended.

The Allen Lumber & Box Company, Nashville, Ark., has been incorporated with a capital stock of \$120,000 by J. H. Allen, W. J. Lockwood, and others, and will acquire the Graysonia-Nashville Company's plant and add equipment to it.

Benton, Ark., will proceed at once with the equipment of sewage disposal plant and waterworks to cost \$100,000. The J. B. Crary Company, Atlanta, Ga., is the engineer.

The Golden Stave Company, Cotter, Ark., has been incorporated with a capital stock of \$10,000 by Ray R. Ramey, J. W. Williamson and E. Billingsley.

Dollahon & Co., Smithton, Ark., are reported in the market for equipment for making fuel briquettes from sawdust and similar material.

The Bartlesville Interurban Company, Bartlesville, Okla., will enlarge the capacity of its power plant at a cost of about \$5000.

Custer, Okla., will install a 10-ton ice plant at a cost of about \$10,000. H. H. Hatchett is superintendent of the water plant.

The Vinita Brass Works, Vinita, Okla., has been incorporated with a capital stock of \$50,000 by J. F. Watkins, J. M. Jones and L. N. Ditto, and will install equipment for brass working.

The Morris Machine & Tool Company, Morris, Okla., recently incorporated, has been in operation over a year. It does general repair work, specializing on oil tools and oil machinery. It is considering the addition of other lines of work. Elbert G. Cunningham is president, and W. P. Cunningham, shop manager.

The Bartlett-Collins Glass Company, Sapulpa, Okla., will equip a 12-pot, six-ring plant for the manufacture of pressed and blown glassware. It is in the market for this equipment.

The Safety First Nut Lock Mfg. Company, Shawnee, Okla., has been incorporated with a capital stock of \$35,000 by R. L. Austin and Sam L. McKelvey, Shawnee, and Henry C. Austin, Wilburton, Okla.

The Southwestern Motor Wheel Company, Tulsa, Okla., has been incorporated with a capital stock of \$10,000 by Frank P. Peterson, E. W. Rickey and R. E. Andrews.

Sewage disposal and waterworks plants to cost about \$20,000 will be installed by the Agricultural and Normal School, Langston, Okla.

The Economic Power & Products Company, of which W. D. Miller, Lafayette Building, Philadelphia, Pa., is secretary, will equip a plant at Greenwood, Miss., with a capacity of 50 tons of pulp daily. The company is capitalized at \$10,000,000. Other plants will probably follow this initial venture.

The Rex Planing Mill Company, Meridian, Miss., of which C. L. Gray is president, will rebuild its plant which has been destroyed by fire.

Okolona, Miss., will equip a sewage disposal plant, etc., under a bond issue of \$58,000.

The city of Bastrop, La., has voted a bond issue of \$16,000 to equip an electric light plant and extend its waterworks plant. The mayor is in charge.

The Rapides Gravel Company, George K. Force, manager, Alexandria, La., will install equipment to develop a deposit at Woodworth, La.

The sewerage and water board, New Orleans, La., of which F. S. Shields is secretary, is in the market for additional equipment for drainage pumping station No. 2, and will receive bids until April 19 next.

De Ridder, La., will expend about \$40,000, already authorized, to buy a privately owned waterworks plant and increase and improve the equipment. It will also construct a sewage disposal plant.

Eastern Canada

TORONTO, ONT., March 1, 1915.

Additional war orders are coming forward. The orders for shrapnel shells have reached a total of \$29,000,000, and for ammunition and equipment of all kinds, \$100,000,000. In number the contracts are fully 10,000. The British Government has ordered 10 submarines, which are being built at Montreal.

The H. Laugheed Machine Company, Sarnia, Ont., has received orders for shrapnel shells, and will install additional machinery.

The Montreal Ammunition Company, Ltd., Montreal, has been incorporated with a capital of \$300,000 to manufacture shells and ammunition. Erastus E. Howard, Jacob De Witt and Henry C. McNeil, Montreal, are among the incorporators.

Wood-working lathes, machine lathes, foundry, forge and machine shop equipment, printing presses and steel lockers are wanted by the Board of Education, Toronto, for the new central technical school. W. C. Wilkinson is secretary.

Clarke Products, Ltd., Toronto, has been incorporated to manufacture automobile heaters and accessories. The capital stock is \$40,000. Among the provisional directors are John Y. and James Y. Murdoch.

New Idea Spreader Company, Ltd., Guelph, Ont., has been incorporated with a capital stock of \$250,000 to manufacture manure spreaders and other agricultural implements. J. A. and B. C. Oppenheim, Charles A. Mullenix, Coldwater, Ohio, are the incorporators.

Fire did over \$20,000 damage to the factory of the Canadian Moorehead Mfg. Company, Ltd., manufacturer of steam traps, Woodstock, Ont., on February 26. The J. G. Webb Company, organ manufacturer, also lost heavily at the same time.

Port Hope, Ont., will receive tenders up to March 15 for low-lift centrifugal pumps, motors, oil engine, etc. The F. W. Thorold Company, Ltd., 2 Toronto street, Toronto, is the engineer.

Fire on February 24 damaged the property of the Ives Modern Bedstead Company, 32 Colborne street, Montreal, to the extent of \$75,000.

A factory building to cost \$80,000 is to be built at 468 Wellington street, West, Toronto, by L. S. Yolles.

G. M. Gest, Ltd., Montreal, has been incorporated with capital of \$100,000 to manufacture electrical goods.

The Efficiency Boiler Heating Company, Ltd., Ottawa, Ont., has been incorporated with a capital stock of \$100,000 to manufacture smoke consumers and other machinery. The incorporators are W. N. Graham, Harold Hastings and S. E. Farley.

The S. L. Davis Company, Ltd., London, Ont., has been incorporated with a capital stock of \$40,000 to manufacture engines, motors, generators, etc. S. L. Davis, is one of the principals.

The Curtiss Aeroplanes & Motors, Ltd., Toronto, has been incorporated with a capital stock of \$50,000 by James S. Lovell, William Bain, and others. A temporary factory has been secured.

Knight Bros., Burks Falls, Ont., are in the market for a sawmill edger, four power-driven under rolls and two pressure rolls, the front press roll open.

The United States Horseshoe Company, Erie, Pa., is to erect a branch factory on Biggar street, Hamilton, Ont. The firm name will be the Canadian Horseshoe Company.

The Canadian Toy & Novelty Company, Ltd., Montreal, has been incorporated with a capital stock of \$75,000 to manufacture toys and household, store and office furniture. A. Thibault, O. B. Meunier and H. P. Bruyere are among the incorporators.

The Canada Model & Machine Company, Windsor, Ont., has been incorporated with a capital of \$40,000 to manufacture machinery and hardware specialties. William J. Pulling, A. N. and John A. McLean are among the incorporators.

Wettlaufer Brothers, Ltd., Toronto, has been incorporated to manufacture machinery and automobile supplies with a capital stock of \$300,000 by W. L., J. L., and E. L. Wettlaufer and Eldon McDougall.

Procter & Gamble Company, Burlington street, Hamilton, Ont., is to erect a factory to cost \$10,000.

The Canadian Rubber Company, Ltd., Montreal, is issuing \$1,000,000 of stock, part to be used for equipping tire factory at Berlin, Ont.

The Town Council, Durham, Ont., has voted to take over the power plant of N. McIntyre, and to spend \$10,000 on renewals, etc.

The Exolon Company, Thorold, Ont., of which C. J. Brockbank is manager, has completed plans for a factory addition to cost \$25,000.

The Bag Holder & Machine Company, Lucknow, Ont., has been incorporated to manufacture bag holder trucks and wheelbarrows by John Joynt, G. A. Newton and Frank Tate. The capital stock is \$20,000.

The Pacific Coast

SEATTLE, WASH., February 23, 1915.

The most encouraging feature of the local situation is a gradual improvement in the lumber industry, as more plants are resuming operation every week. The statement is widely circulated that the mills are operating at a loss; but many evidently find it cheaper to run than to remain idle. Orders for lumber, domestic and foreign, are unmistakably increasing. Few new plants are being built; but all business and orders from distant points are keeping equipment manufacturers fairly occupied. Conditions in the grain districts are good, giving rise to a steady demand for miscellaneous machinery. Machine-tool inquiries of real importance are still the exception; but the call for small tools and shop supplies is not far below normal for this season. Increasing activity in water and power development, road work and other public improvements is noticeable.

Repair work on coast and Alaska vessels continues unusually active, and shipbuilding plants on Puget Sound report a busy season. The demand for canning machinery is unprecedented. The money situation is comparatively easy, and the incorporations of new companies are numerous.

The Two-Lock Nut Company, Sacramento, Cal., has been incorporated with a capital stock of \$10,000 to manufacture nuts, locks and bolts. The directors are C. E. Weinich, E. C. Kavanaugh, F. F. Smith, John A. Crombach and J. P. Dargitz.

The Bateman Harvester Company, Walla Walla, Wash., has been incorporated by P. H. Bateman, S. Pettijohn and A. L. Ray with a capital stock of \$100,000. It plans the erection of a factory for the manufacture of a patented harvester.

John Schwabland, Aberdeen, Wash., will erect a salmon cannery to be ready for this year's fishing. It is stated that a company will be formed with a capitalization of \$50,000.

The Pacific American Fisheries Company, Bellingham, Wash., which recently purchased the properties of the Lagoon Canning Company in the Bering Sea, announces that it will erect a salmon cannery there at an estimated cost of \$45,000.

The Lebanon Mfg. Company, Lebanon, Ore., has been incorporated by M. D. Good and others. It will build a plant for the manufacture of store service appliances.

Frank W. Cutler and Asa B. Cutler, Hood River, Ore., will remodel a building at Seattle into a factory for the manufacture of apple-sizing machinery.

Plans for the location in Stayton, Ore., of a plant to cost \$20,000 are being made by the Harden Pump Fountain Company, Eugene, Ore.

The Vermont Marble Company, Tacoma, Wash., will make improvements to its quarries at Marble Island, Alaska, to double the output. Additional machinery will be installed.

The power installation of the Western Coopersage Company at St. Johns, Ore., will include between 30 and 40 motors, aggregating about 1000 hp. The plant is designed to receive additional equipment that will nearly double the present installation.

T. J. Simmons, Myrtle Creek, Ore., has invented a compressed air engine, and is negotiating with the Eugene Iron Works, Eugene, Ore., for its manufacture.

Ashland, Ore., has commissioned Smith, Emery & Co., engineers, San Francisco, to prepare plans for the water system for which \$175,000 of bonds have been voted.

The Buckman Mfg. Company, Spokane, Wash., has been incorporated for \$50,000 by N. C. Buckman, J. Dempsey and J. Fitzgerald. It is announced that it will build a factory.

The Columbia Ice & Cold Storage Company, of Wenatchee, Wash., incorporated for \$75,000, will erect an ice and cold storage plant. The incorporators are Rueben O. and Benj. H. Cedargreen and others.

The Clarland Iron Works, Seattle, has been incorporated for \$10,000 by D. C. Bissland and A. B. Clark. Skeel & Whitney, 1007 Alaska Building, are attorneys for the company.

Trade Publications

Heaters.—Alberger Heater Company, Buffalo, N. Y. Catalogue. Illustrations and descriptive matter explain the use and operation of a multi-head line of heaters for boiler feed, supplying hot water for industrial plants and heating oil. A number of views of installations of the heaters are presented, together with sketches showing the preferred piping arrangements. Mention is also made of the application of this principle to equipment for cooling oil and air, and a brief description is included of an expansion joint designed to prevent the wear and tear of packing that is experienced in slip tube expansion joints. A number of tables of useful information are included in the catalogue.

Storage Battery Locomotives, Cranes and Cars.—Atlas Car & Mfg. Company, Cleveland, Ohio. Bulletin No. 1175. Illustrates and describes a line of electric storage battery locomotives for mine and industrial plant use, storage battery trucks, with and without cranes, and storage battery cars. In addition to the views of the locomotives and trucks there are views of them in use in mines and industrial plants. Illustrated descriptions of the trucks and tractors, and one of the storage battery locomotives covered appeared in *The Iron Age*, November 6, 1913, and May 28, 1914, respectively.

Water Tube Boilers.—Gas Engine & Power Company and Charles L. Seabury & Co., Consolidated, Morris Heights, N. Y. Catalogue No. 10-B. Mentions a water tube boiler that is designed for use with either stationary or marine engines. The special features claimed for the boiler are light weight and a minimum amount of floor space per horsepower. The construction of the boiler, which consists of a single steam drum connected to two lower or mud drums by two nests of staggered bent tubes, inclosing a large combustion chamber, is described at some length, the text being supplemented by numerous engravings of the various parts of the boilers. Instructions on the operation and care of these boilers, which can be used with either coal, wood or oil fuel, are included, together with views of a number of plants and vessels upon which they have been installed.

Drilling Machine Table.—Aurora Tool Works, Aurora, Ind. Circular. Deals with a compound table for a drilling machine which was illustrated in *The Iron Age*, October 22, 1914. An adjustable support under the table prevents springing of the table arm. Both lateral and longitudinal movements are provided for the table, which can be swiveled to any desired angle. An illustration of the table, as well as one of the old style table which it supersedes, is presented.

Oxygen Testing Apparatus.—International Oxygen Company, 115 Broadway, New York City. Bulletin No. 14. Calls attention to an apparatus for determining the purity of oxygen quickly and accurately. An illustration of the set, which is of simple construction and self-contained, is presented, together with a brief statement of the way in which it is used. Mention is made of the accuracy of the results that can be secured with this set even when used by unskilled labor.

Bar and Pipe Bending Machines.—Wallace Supplies Mfg. Company, 412 Orleans street, Chicago, Ill. Pamphlet. Lists a line of hand power bending machines for bars which are intended for forming round, square and twisted bars into various shapes, and illustrations of a number of pieces that have been turned out by them are included. Mention is also made of a line of machines for forming eyes in round stock and a machine for bending pipe in sizes ranging from 1 to 2 in. in diameter and radii between 6 and 14 in.

Sheet Metal Working Machinery.—H. Collier Smith, 807 Scotten avenue, Detroit, Mich. Catalogue No. 50. Gives general description and specifications for a line of metal working machinery for the manufacture of automobile bodies, fenders, hoods and tanks; ventilating, shavings and dust collecting systems; blowers, steam boilers, steel cars, carriers, general sheet metal work, etc. After a brief account of the origin and development of this line of machinery and some illustrations of what can be cut by the shearing machines, a general description of the shearing machines follows. This in turn is succeeded by illustrated descriptions of the various machines making up the line, and the same arrangement is followed for the power hammers. Mention is made of a universal machine for handling all forms of edging and wiring, a power feeding machine, a rolling-in machine and a fender stiffener.

Mine Cars.—Harris-Stevens Company, Pittsburgh, Pa. Pamphlet. Presents a description with numerous illustrations of a line of metal and wooden mine cars. One of the special features upon which emphasis is laid is the strength of the running gear, a solid flanged plate and box truck being used. The car can be equipped with either roller or

ball bearings, and diagrams showing the arrangement supplied are presented. Mention is made of a line of mine car hitchings and fans.

Valves.—Homestead Valve Mfg. Company, Inc., P. O. Box 1754, Pittsburgh, Pa. Two folders. Describe a line of quarter-turn valves of the plug cock type, in which only a quarter turn of a wrench or a simple lever handle is required to open or close the valve. Views of the various types of valves that can be supplied are presented, as well as a number of views of installations.

Centrifugal Pumps.—Goulds Mfg. Company, Seneca Falls, N. Y. Form No. 8960, superseding No. 8866. Describes a line of multistage single-suction horizontal centrifugal pumps which can be furnished in from two to five stages, according to the conditions encountered in service. One of the special features of the pump is that the bearings can be removed without disturbing the pump shaft. The description of the pump is supplemented by a condensed table of sizes and approximate capacities, and views of the pump directly connected to an electric motor and with the upper half of the casing raised and the bearings removed are presented.

Mechanics' Tools.—Keystone Mfg. Company, Buffalo, N. Y. Catalogue No. 22. Covers a line of mechanics' tools that include ratchets, socket and tap wrenches, stud drivers, adjustable S wrenches, taper sleeves, steel sockets, drilling posts, etc. There is practically no descriptive text in the catalogue, the illustrations of the different tools being relied upon to tell the story. A single page is given over to practically each tool with an illustration and a list of the various sizes that can be supplied with prices.

Universal Joint.—Plank Flexible Shaft Machine Company, Grand Rapids, Mich. Circular. Describes a three-piece universal joint for use on automobiles, multiple drilling and milling machines, and similar service, which was illustrated in *The Iron Age*, April 16, 1914. A brief description of the arrangement and construction of the joint is presented, with illustrations showing it assembled. One of the special features claimed for the joint is that it can be operated up to a maximum working angle of 35 deg., without impairing its efficiency.

Technical Paints.—Cheesman & Elliot, 100 William street, New York City. Pamphlet. This is the ninth edition of a pamphlet that relates to the use of paints for covering galvanized iron, steel, tin, brick, copper, wood, etc. Specifications for general classes of work are given, followed by a review of technical paints, which discusses the causes of the decay of paint, pigments and vehicles and coatings for reinforced concrete and cement, steel bridges, power plants and freight cars. Brief descriptions of the company's various standard paints are presented, with lists of the places where they have been used.

Gas Engines.—C. & G. Cooper Company, Mt. Vernon, Ohio. Bulletin No. 54. Concerned with gas engines for driving gas and air compressors and electric generators. The bulletin consists almost entirely of engravings of installations of the engines, the captions giving the essential features of the installation.

Firebrick.—Evans & Howard Fire Brick Company, 915 Market street, St. Louis, Mo. Pamphlet. Pertains to firebrick and refractory material for blast and open-hearth furnaces, hot blast stoves, coke ovens, cupolas, kilns, boiler settings, etc. Illustrations and brief descriptions of the various brands are presented, followed by engravings showing the several standard shapes and some of the special ones that can be supplied.

Ball Bearings.—Fafnir Bearing Company, New Britain, Conn. Catalogue No. 15. Shows by numerous engravings the construction of a line of ball bearings which are made in the radial, cone and thrust types. After the description which accompanies these engravings illustrations with dimension tables of the various types of bearings that can be supplied are presented.

Safety Set Screws.—Allen Mfg. Company, Hartford, Conn. Pamphlet. Treats of a safety set screw in which a clean hexagonal socket extends to the bottom of the hole. A number of views showing the construction of the screw are presented, together with one showing the variety of lengths, points and diameters that can be furnished. Mention is also made of a socket head type of cap screw.

Pipe.—Youngstown Sheet & Tube Company, Youngstown, Ohio. Pamphlet. Contains numerous illustrations and a more or less complete description of the various processes involved in the making of pipe of various kinds and sizes. The description starts with the mining of the ore and is carried through the plant until the pipe is shown packed for shipment on a railroad car. Both steel and iron pipe are included in the description.

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